	Studiengang: *Program:*	**Bachelor of Science Maschinenbau** *Bachelor of Science in Mechanical Engineering*			FACH HOCHSCHULE LÜBECK University of Applied Sciences
1	**Modul:** *Module:*	**Intermediate Mechanics of Materials** *Intermediate Mechanics of Materials*			**English** *English*
		Semester *Semester*	**Dauer** *Duration*	**Status** *Status*	**Turnus** *Regular cycle*
		5. Semester	1 Semester	compulsory	annually
	Kreditpunkte *Credits*	**Aufwand** *Workload*	**Kontaktzeit** *Contact-hours*	**Selbststudium** *Student's efforts*	**Gruppengröße** *Team size*
	5 ECTS	150h	3SWS = 45h lectures 1SWS = 15h labs	30h pre-/post-preparation 60h exercises	< 12 (lecture) < 6 (lab)

2 Beschreibung
Description

This course continues the study of the mechanics of deformable bodies. The theoretical background is enlarged by introducing the more general concepts of three dimensional stress/strain states as well as energy methods. Failure theories then allow to handle multi-axial loadings on deformable bodies. Further, emphasis is put on applying the underlying theory to real problems. Topics include statically indeterminate structures and stresses in miscellaneous structures (shear in thin members, torsion in non-circular members, pressure vessels, etc.). Finally an introduction is given to stability problems, focusing on the phenomenon of buckling of columns. Laboratory topics include experiments to reinforce stress/strain behavior topics and design projects.

3 Lernziele
Learning Outcomes

- understand the assumptions inherent in approximate theories of stress and strain
- familiar with several failure criteria (static or dynamic) and be able to apply an appropriate criterion for a given material/stress state
- be able to calculate beam deflections using discontinuity functions
- know how to find solutions for thin-wall members under transverse loading
- know how to find solutions for non-circular members under torsion loading
- be able to solve statically indeterminate problems
- be familiar with column design codes (steel, aluminum, and timber) and be able to design compression members
- be familiar with stress and strain/deflection measurements, including reduction of strain rosette data
- have completed design exercises in which iterations were required to find an acceptable solution

4 Schlüsselqualifikationen
Key qualifications

Sozialkompetenz	Methodenkompetenz	Selbstkompetenz / Personenkompetenz	Interkulturelle Kompetenz	Medienkompetenz
X	X	X		

5 Lehrveranstaltung/ -methoden
Course type and methods

Vorlesung / Lectures

- Lectures, that will take form of seminars
- Treatment and discussion of a case study
- Drill and practice

Praktikum/Projekt / Lab

- Preparation and performance of experiments including recording and evaluation of test results

6 Vorbedingungen / Vorkenntnisse
Prerequisites

Strongly recommended

- Statics, basic strength of materials
- Integral and differential calculus
- ME-207 (according to MSOE Standard) or equivalent course

7 Arbeitsmittel / Literatur
Required material / Literature

- Handouts to lecture, to exercises and to labs
- Mechanics of Materials, 4th ed. (or later) R.C. Hibbeler, Prentice Hall

Detailinformationen

8 Inhalte

Course topics

Vorlesung / Lecture

- **Review of fundamental mechanics of materials topics**
- **Basics of theory of elasticity**
  - Concept of stress
  - Concept of strain
  - Material laws
  - Elastic strain energy
- **Failure theories**
- **Selected topics to mechanics of materials, including**:
  - Axial loads in members with varying cross-sections
  - Curved beams
  - Beam deflections by using discontinuity functions
  - Torsion in members with solid, non-circular cross-sections
  - Torsion in members with hollow, non-circular cross-sections
  - Pressure Vessels
  - Statically indeterminate structures
- **Introduction to energy methods**
  - Impact loadings
  - Principle of virtual work
  - Method of virtual forces
- **Stability problems: column design**

Labor / Labs:

- **Lab 1: stresses, strains and deflection in a beam**
- **Lab 2: failure theories**
- **Lab 3: torsion in shafts**
- **Lab 4: buckling of columns**

9 Prüfungsform

Assessment

Prüfungsvorleistung / Prerequisite: none
Fachprüfung / Examination: written test

10 Voraussetzung für die Vergabe von Kreditpunkten

Requirements for granting of credits

- Issuing of lab-reports, being on an acceptable level with respect to content and format
- Successfully passing all individual parts of the examination according to row 9 „Assessment“

11 Stellenwert der Note in der Endnote

Meaning of the mark concerning final exam

Anteilig / proportionally: 5/240

12 Weiterführende Veranstaltungen

Related courses

Senior design project (4-th year at MSOE)

13 Bezug zu Zielen des Studiengangs

Related objectives of the study program / Outcomes

- The goal is to produce mechanical engineering graduates with a strong theoretical and applications background, whose analytical, design and laboratory experiences make them attractive to industry
- (1) The student will have a knowledge of and an ability to apply multivariable calculus, differential equations, linear algebra, and statistical methods to the solution of engineering problems.
- (2) The student will have a knowledge of and an ability to apply principles of chemistry and calculus-based physics to mechanical engineering systems.
- (3) The student will have an ability to function within a laboratory, including the abilities to plan and execute structured experiments, and to analyze and interpret data.
- (5) The student will have the ability to identify, formulate, model and solve engineering problems.
- (10) The students will have the ability to write technical reports and make technical presentations of their work.

14 Zuordnung

Classification

Mathematik & Naturwissenschaft	Ingenieur-wissenschaften	Ingenieur-anwendungen	Entwicklung & Konstruktion	Werkstoffe	Wirschaft, Management, Sprachen	Anderes
	X	X	X			

15 Modulbeauftragter / Lehrpersonen

Responsible person / Lecturers

Prof. Dr.-Ing. Hans Reddemann / Prof. Dr.-Ing. Hans Reddemann