Studiengang: **Bachelor of Science Maschinenbau**
Program: *Bachelor of Science in Mechanical Engineering*

FACH HOCHSCHULE LÜBECK
University of Applied Sciences

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Module: **Vibration Control**
Modul: *Maschinendynamik*

English
English

Semester *Semester*	**Dauer** *Duration*	**Status** *Status*	**Turnus** *Regular cycle*
6. semester	1 semester	compulsory	annually

Kreditpunkte *Credits*	**Aufwand** *Workload*	**Kontaktzeit** *Contact-hours*	**Selbststudium** *Student's efforts*	**Gruppengröße** *Team size*
4 ECTS	150h	4SWS = 60h lectures	30h pre-/post-preparation 60h exercises	< 25 (lecture)

2 **Beschreibung**
Description

This course gives an introduction to mechanical vibrations, to free and forced vibrations of different mechanical systems. Various types of forcing functions are considered/investigated for both damped and undamped systems. Aspects of measuring and controlling vibrations are also considered.

3 **Lernziele**
Learning Outcomes

- model simple vibratory systems.
- determine equations of motion for idealized systems.
- solve equations of motion for single degree of freedom systems subject to harmonic, general periodic and arbitrary forcing functions.
- write equations of motion for idealized multi-degree of freedom systems.
- determine natural frequencies and mode shapes for systems with two and three degrees of freedom.
- estabilish technical measures to handle vibrations in mechanical systems as desired.
- be able to identify and estimate system parameters for lumped parameter systems

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
- Drill and practice
- Demonstration of various kinds of vibration measurements within lab

Praktikum/Projekt / Lab

- Lecturing will be accompanied by introducing students to using a Multi-Body-Simulation-Software and solving various tasks of different skill-levels

6 **Vorbedingungen / Vorkenntnisse**
Prerequisites

Strongly recommended

- Basics of dynamics
- Integral and differential calculus, including differential equations as well as systems of differential equations

7 **Arbeitsmittel / Literatur**
Required material / Literature

- Handouts to lecture and to exercises
- Schaum's series: Mechanical Vibrations S.G. Kelly, McGraw Hill,
- Fundamentals of Mechanical Vibrations S.G. Kelly, McGraw Hill Higher Education
- Recommended supplementary literature according to handout to lecture

Detailinformationen

8 Inhalte

Course topics

Vorlesung / Lecture

Review: Modeling mechanical systems
Review: Solving differential equations - analytical, numerical methods
Systems with one degree of freedom
- Free vibration.
- Harmonic excited vibrations
- Fourier series, periodic functions
- Transient vibrations

Systems with two or more degrees of freedom
- Derivation of governing equations
- Free vibrations
- Forced vibrations

Vibration Measurement and Analysis
Vibration Control
Introduction to Vibrations of continuous systems

9 Prüfungsform

Assessment

Prüfungsvorleistung / Prerequisite: none
Fachprüfung / Examination: written test

10 Voraussetzung für die Vergabe von Kreditpunkten

Requirements for granting of credits

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.

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