Course Specifications
Valid as from the academic year 2019-2020

Due to Covid 19, the education and evaluation methods may vary from the information displayed in the schedules and course details. Any changes will be communicated on Ufora.

Lecturers in academic year 2019-2020
Monte, Michael TW08 lecturer-in-charge
Vervisch, Bram TW08 co-lecturer

Course offerings and teaching methods in academic year 2019-2020
A (semester 1) Dutch, English HoWest seminar: practical PC 12.0 h room classes
project 12.0 h lecture 12.0 h guided self-study 12.0 h demonstration 12.0 h

Offered in the following programmes in 2019-2020
Master of Science in Electromechanical Engineering Technology 6 A

Teaching languages
Dutch, English

Keywords
mechanical vibrations, signal analysis, mass-spring-damper systems, computer aided engineering, finite element analysis

Position of the course
Being able to estimate and dimensioning the dynamical properties of structure is of crucial importance in mechanical engineering. Other than analytical modeling techniques, there exist discretization techniques such as finite elements to model complex structures and to estimate these properties. Also a correct interpretation of the time- and frequency domain responses is necessary. In the course machine optimization I, the student learns to master the basic principles of mechanical vibrations and finite element methods.

Contents

Mechanical vibrations
The student is introduced into the signal analysis needed to measure and analyse mechanical systems. Insight is gained in classical mass-spring-damper systems and it is learned to model systems with higher complexity. Systems with multiple degrees of freedom are studied. With modal analysis, such systems are decoupled into systems with one degree of freedom of which the responses can be calculated. Also, the selection of passive vibration isolators are discussed.

CAE
The student gets insight in the theory of finite element modeling in the domain of mechanical dimensioning. He/she has to apply these acquainted knowledge to dimension a design project according to strength, stiffness and vibrations. All principles are illustrated by simple examples and exercises. In addition, commercial CAE tools are used to solve specific engineering problems. Emphasis is laid to analyzing a defined problem correctly, selecting the appropriate solving method, selecting correct boundary conditions and loads for a simplified model, and a correct interpretation of obtained results of CAE calculations.

Initial competences
Machine elements I, mechanics of materials and Kinematics and Dynamics

(Approved)
Final competences

1. Have insight in different aspects of finite element modelling
2. Being able to interpret the results of a finite element analysis correctly.
3. Being able to develop a model with the correct boundary conditions into a commercial software (Siemens NX).
4. Being able to expand a structure into a mass-spring-damper combination and to derive and interpret the time-and frequencydomain response.
5. Being able to apply and interpret modal analysis. Being able to select passive vibration isolation.
6. Being able to choose passive vibration isolation

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment.

Conditions for exam contract

This course unit cannot be taken via an exam contract.

Teaching methods

Guided self-study, demonstration, lecture, project, seminar: practical PC room classes.

Extra information on the teaching methods

CAE
Exercises and assignments during the year, handed in according to the planning. All information is provided on the electronic learning environment.

Mechanical Vibrations
Practical examples with Matlab.

Learning materials and price

Noise and vibration analysis (Anders Brandt)
Purchase book ISBN 9708047074648
Course notes and slides (CAE)

References

- Simulations with NX Reiner Anderl and Peter Binde, ISBN: 978-1-56990-479-4

Course content-related study coaching

The lecturers are available through e-mail or appointment.

Evaluation methods

end-of-term evaluation and continuous assessment.

Examination methods in case of periodic evaluation during the first examination period

Open book examination, oral examination, report.

Examination methods in case of periodic evaluation during the second examination period

Open book examination, oral examination.

Examination methods in case of permanent evaluation

Report.

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible in modified form.

Extra information on the examination methods

40% PE Mechanical vibrations: Oral exam with written preparation
30% PE CAE: exam on PC (Siemens NX)
30% NPE CAE: reports.

Calculation of the examination mark

First examination period

Final Score (20) = C1xP1 + C2xP2 + C3xP3
C1, C2 and C3 are weighing coefficients and P1, P2 and P3 are the scores (on 20)
P1: PE: exam mechanical vibrations
P2: PE: exam CAE
P3: NPE: report CAE

(Approved)
C1 = 40%
C2 = 30%
C3 = 30%

In order to pass for the course a score of at least 6/20 must be achieved for both mechanical vibrations and CAE. If this condition is not met, a deviation from the calculated score (if 10 or more) will be made and the score will be lowered to 9/20.

**Second examination period**

Final Score (20) = C1xP1 + C2xP2 + C3xP3 + C4xP4
C1, C2, C3 and C4 are weighing coefficients and P1, P2, P3 and P4 are the scores (on 20)
- P1: PE: exam mechanical vibrations
- P2: PE: exam CAE
- P3: NPE: report CAE (first examination period)
- P4: NPE report CAE

C1 = 40%
C2 = 30%
C3 = 15%
C4 = 15%

In order to pass for the course a score of at least 6/20 must be achieved for both mechanical vibrations and CAE. If this condition is not met, a deviation from the calculated score (if 10 or more) will be made and the score will be lowered to 9/20.