Munich Summer School of Applied Sciences

Course description

• Course title: **Design of Lightweight Structures**

• Hours per week: 12h/week, 4 weeks

• Number of credits allocated/ work load:
  a) 48 contact hours
  b) 3 US credits recommended
  c) 4 ECTS credits

• Course contents:

  1. **Short description**

  Transportation whether it is land, sea or air will consume less energy if mass is minimized. Bringing down the mass of moving parts in all kinds of machines makes them faster, more precise and more efficient. This course deals with both machine and structural design from the standpoint of minimizing mass. A complex design project will be solved in teamwork. The course starts teaching methodologies for finding concepts. Basic analytical calculation methods concerning metallic and composite materials are taught. Additionally basic problems arising in dimensioning and analysing thin-walled structures are discussed using the finite element program ABAQUS. A short introduction to the finite element program ABAQUS is included. Bending and buckling behaviour of thin-walled structures using ABAQUS will be investigated.

  2. **Contents**

    ➢ **Methodologies for conceptual work**
    ➢ **Machine design**
    ➢ **Structural design**
    ➢ **Metal materials**
    ➢ **Composite materials**
Analytical stress and strain calculations
Thin-walled structures
Introduction to ABAQUS
Using ABAQUS

Prerequisites: Profound knowledge in Mechanical Design and 3D CAD. Candidates should be in the final part of their mechanical engineering study. Furthermore: Materials, mechanics of materials, and structure or machine design. Basic knowledge in the theory of finite element analysis

Objective of the course/learning outcome: Handling a major design problem and creating concepts. Conceptual work, calculations, using design tools and methodology. Shape and material selection in lightweight structure basic knowledge of composites or engineered materials.

Recommended reading:
- Pahl/Beitz: Engineering Design.
- David G. Ullman: The Mechanical Design Process
- Jones; Mechanics of Composite Materials 2nd Ed. or equivalent

Teaching methods: Coaching design project, lectures, assigned problems and/or exercises

Assessment methods: Milestones, Final Presentation, Examination

Language of instruction: English

Name of lecturers: Prof. Christoph Maurer (University of Applied Sciences – München)
Prof. Jörg Middendorf (University of Applied Sciences – München, Munich),
Prof. Joe Mello (California Polytechnic State University, USA)