

Short Course

3-5 pm
October 5, 7,
10 & 12

Watt
Family
Innovation
Center
Room 307

Instructor:
Roland Platz



The short course is made possible by the German Collaborative Research Center SFB 805 "Control of Uncertainty in Load-Carrying Structures in Mechanical Engineering", Technische Universität Darmstadt, funded by the German Research Foundation DFG, and offered by Dr. Roland Platz, senior research fellow at Fraunhofer Institute for Structural Durability and System Reliability LBF, Darmstadt.

Controlling Uncertainty via Smart System Technology

Structural design processes are in general split into the following basic stages: (i) having an idea, (ii) defining specifications based on expected loading, (iii) deriving concepts for adequate structural integrity, (iv) choosing and optimizing the concepts, (v) selecting final design, (vi) fabricating, testing and, eventually, initiating serial production. In every stage in this process, uncertainty originates from various sources that may lead to failure in later utilization. The sources of such uncertainty are lack of information, tolerances, limited resources and human deficiency. Consequently, uncertainty differs throughout the design process and needs to be quantified and evaluated differently for each design stage. Knowing the type, dimension, significance, relevance of uncertainty is critical, especially in early design stage. If uncertainty is ignored in early design, it will propagate and cumulate through the following stages of the development processes.

Active and semi-active or "smart systems" technologies in structures may account for such uncertainties. Smart structures may react to critical loading with tailored properties and adaptation, mostly through external energy that is fed into the structure. Examples are active vibration control, stability control, load distribution control or crack growth control. Even though smart structures help addressing uncertainty, their processes are uncertain as well. Main challenges are adequate coupling of design specifications with smart materials together with the use of sensors, actuators, interfaces, electronics and signal processing for control capability.

Intended Audience and Scope

This class is suitable for faculty, graduate and undergraduate students who are interested in (i) means to control uncertainty by smart structure technologies, and (ii) state-of-the art and newly developed probabilistic and non-probabilistic methods to quantify and to evaluate data and model uncertainty in structural dynamical systems. Participants should have a basic background and interest in structural dynamics.

To register for the short course:

email your name and department to agoswic@g.clemson.edu

To reserve a time to meet with the speaker:

contact Dr. Atamturktur, sez@clemson.edu