

Title: Nonlinear Control and Servo Systems / Ikke-lineær regulering og servosystemer
ECTS credits: 5
Prerequisites: The students are only assumed to have had one introductory control course. No mathematical background beyond ordinary differential equations and elementary matrix algebra is required
Relevant for: OES, MCE, PED, WPS, EPSH
Objective: Students who complete the module should have the following knowledge, skills and competence:
<p>Knowledge</p> <ul style="list-style-type: none"> • Modelling and basic phenomena (linearization, phase plane analysis, limit cycles) • Analysis methods (Lyapunov, circle criterion, describing functions) • Common nonlinearities (Saturation, friction, backlash, quantisation) • Design methods (Lyapunov methods, Backstepping, feedback linearization, sliding control, optimal control, adaptive control) <p>Skills</p> <ul style="list-style-type: none"> • Be able to judge the usefulness of the different analysis and design methods • Be able to apply the learned knowledge to analyze and study nonlinear dynamical systems • Be able to apply the learned knowledge to design of nonlinear control systems using commercial software • Analytical tools for studying nonlinear systems <p>Competence</p> <ul style="list-style-type: none"> • Improvement of existing control linear control systems by using nonlinear controllers • Analysis of hard nonlinearities that can not be derived from linear analysis, hence their effects must be predicted and properly compensated for. • Dealing with model uncertainties where inaccurate or obsolete values of model parameters may exhibit significant performance degradation. • Design simplicity. Good nonlinear control designs may be simpler and more intuitive than their linear counterparts
Type of instruction: All modules include exercises focusing on the presented material. Some exercises will be done using Matlab and Simulink. The course will be planned and organized in close interaction with on-going research and development activities at the Department of Energy Technology
Examination format: Individual oral examination based on a delivered mini-project/test report and will be held in accordance with the rules in the Examination Policies and Procedures, Addendum to the Framework Provision at Faculty of Engineering and Science, Aalborg University
Evaluation criteria: As stated in the Framework Provisions