



Robust and Reliable Control Systems Design

12th – 14th May 2009

Day 1 : Introduction to Robust Control

- 09.00 *Registration*
- 09.30 Need for Robust and Reliable Control and Assessing Stability**
(Tools for assessing the stability of linear multivariable systems)
- 10.15 Uncertainty in Systems and Robust Control Design Fundamentals**
(Including methods to estimate uncertainty, types of uncertainty & robustness)
- 11.15 *Tea/Coffee*
- 11.30 Inherent Robustness Properties of State Feedback LQ Optimal Control**
(Including stability and multivariable gain and phase margins)
- 12.15 *Lunch*
- 13.00 *Hands-on Session: State Feedback LQ Optimal Control and Robustness*
- 14.00 Introduction to Kalman Filtering for Control and Condition Monitoring**
- 14.45 *Hands-on Session: State Estimation for Systems with Unmeasured States using Kalman Filter*
- 15.30 *Tea/Coffee*
- 15.45 LQG Control Design Approach for Disturbance Rejection**
(Uses the Kalman filter/observer but reduces robustness)
- 16.30 *Hands-On Session: Use of Dynamic Cost Function Weightings to Improve LQG Designs*
(Improving robustness properties and performance)
- 17.00 *Close*

Day 2 : LQG and H-infinity Control Design

- 09.00 Introduction to Loop Transfer Recovery Design Methods**
(Recovering robustness of LQR designs in LQG control)
- 09.45 **Hands-on Session: LQR/LQG and LTR Designs**
(Including cost function weighting selection for robust control)
- 10.45 *Tea / Coffee*
- 11.00 Introduction to H-infinity Robust Control Methods and Advantages**
(Overview of algorithms and design methods including weighting selection)
- 12.00 **Hands-On Session: H-infinity Robust Control**
(Weighting selection procedures and design experience)
- 13.15 *Lunch*
- 14.00 Robust Control Design Procedures and Design Issues**
(Relationship between LQG and H-inf controllers, guidance on what to do and to avoid in the design process)
- 15.00 H-infinity Reliable Control Systems Design Methods**
(Introduction to reliable control design and hot strip mill example, introduction to mu analysis tool for testing and flight control design example)
- 15.45 *Tea/Coffee*
- 16.00 Quantitative Feedback Theory. A Powerful Robust Design Method**
(Introduction to QFT, link to H-inf and unmanned aerial vehicle example)
- 17.00 *Close*

Day 3 : Predictive and Nonlinear Control Design and Fault Monitoring with Application

- 09.00 Introduction to Predictive Control Design Methods**
(Advantages of using predictive control for systems with constraints)
- 10.00 Hands-on Session: Introducing Predictive Control Design and Results
- 11.00 *Tea / Coffee*
- 11.15 Introduction to Fault Detection Methods**
- 12.00 Hands-On Session: Model based fault monitoring methods
(Including link to fault monitoring and nuclear reactor example)
- 13.00 *Lunch*
- 13.45 Fault Tolerant, Safe and Reconfigurable Control**
(Including different control structures and reconfiguration methods)
- 14.45 Simple Nonlinear Controllers and Compensation Methods**
(Effects of nonlinearities and time delays and compensation methods)
- 15.30 *Tea/Coffee*
- 15.45 Hands-on Session: Introducing Nonlinear Control
(Including cost function specification for good nonlinear robust control)
- 16.30 *Close*