

- industry cross-fertilisation
- technology transfer
- industry forum
- seminars
- consultancy and case studies
- training

Linear and Nonlinear Predictive Control Systems

MPC Design and Applications – Agenda (2-days Course)

Day 1: Optimal and MPC for Linear and Nonlinear Systems

- 09.00 Introduction to Predictive Control Main Principles and Concepts**
(Motivation, Prediction, Cost-functions, Receding horizon, Polynomial approach)
- 10.00 *TEA/COFFEE*
- 10.15 Linear Optimal Model Predictive Control**
(Polynomial and State-Space approaches, MPC basic principles and features)
- 11.15 Hands-On Session: Linear Predictive Control – MPC example**
- 12.00 *LUNCH*
- 13.00 Practical Aspects of Linear MPC Design and Implementation**
(Integral action, Disturbances & Robustness, Tuning and Constraint handling)
- 14.00 Hands-On Session: Designing Model Predictive Controls and Tuning**
- 14.45 *TEA/COFFEE*
- 15.00 Nonlinear System Modelling and Estimation for Predictive Control**
(Nonlinear system modeling methods, State-dependent/LPV models, Time-varying Kalman Filter and the Need for nonlinear predictive control)
- 16.00 Hands-On Session: Nonlinear System Modeling**
(Control problem modelling example, Observers for nonlinear systems)
- 17.00 *CLOSE*

Day 2: Nonlinear Predictive Control Systems Design and Implementation

- 09.00 Introduction to the Predictive Control of Nonlinear Systems**
(Simple nonlinear controls, Nonlinear optimal controls, Control design features and Philosophy/justification).
- 10.00 *TEA/COFFEE*
- 10.15 Predictive Control of Nonlinear Systems**
(Dynamic cost-function weightings, use of LPV models to solve MPC problems).
- 11.15 Hands-On Session: Advanced Nonlinear Control Design**
- 12.15 *LUNCH*
- 13.15 MPC Design Methods and Application Examples**
(incl. Nonlinear marine and wind, Robustness to uncertainties & disturbances).
- 14.15 *TEA/COFFEE*
- 14.30 Application Example: Supervisory Multiple-Model Approach to Lambda and Torque Control**
(Multiple models for automotive engine control)
- 15.15 Emerging Trends in Nonlinear Predictive Control**
(Implicit and explicit schemes, Monte Carlo validation methods, Summary of the trends in nonlinear MPC, Promising algorithms, Adaptive predictive control and Reference governors).
- 16.30 *CLOSE*