

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

## Introduction to Estimation and Kalman Filtering (2-day Course) Agenda

### Day 1

- 09.00 Welcome
- 09.05 Introduction to state-space modelling of linear systems, continuous-time and discrete time systems
- 09.35 Properties of state-space systems, diagonalisation, observability, detectability, controllability, stability
- 10.15 Tea / Coffee
- 10.30 Hands-on 1: modelling & time response simulation of state-space systems (MATLAB / SIMULINK or LabVIEW)
- 11.30 Introduction to probability, stochastic processes & signals, including basic theorems, representation of disturbances & noises in linear systems
- 12.15 Lunch
- 13.15 Hands-on 2: state-space systems with noise and disturbance
- 14.15 Intuitive introduction to the Kalman Filter (discrete & continuous)
- 15.15 Tea / Coffee
- 15.30 Discrete-time Kalman Filter derivation, properties, Riccati equation, tuning
- 16.30 Close

### Day 2

- 09.00 Hands-on 3: application of observers & building the Kalman Filter
- 10.15 Tea / Coffee
- 10.30 Introduction to Time-varying & non-linear systems
- 11.15 Extended Kalman Filter for non-linear systems
- 12.00 Lunch
- 13.00 Hands-on 4: applications of Extended Kalman Filters
- 14.00 Parameter estimation using EKF, including condition monitoring, model based fault detection methods
- 15.00 Tea / Coffee
- 15.15 Hands-on 5: Kalman Filtering for parameter estimation
- 16.15 Robust Kalman and  $H^\infty$  filtering for uncertainty in the model
- 17.00 Close