
W3: *Fault-Tolerant Control for Industrial Automation*

Prof. Ron Patton

This workshop, divided into three lectures, will present key developments in the field of Fault-Tolerant Control (FTC), beginning with fundamental definitions and core challenges. The series will place particular emphasis on robustness considerations and highlight significant application domains.

Lecture 1: Principles of Model-Based Fault Monitoring and Fault-Tolerant Control (FTC).

This lecture will cover:

(i) Architectures and classifications of FTC strategies

(ii) Definitions and concepts in Fault Detection and Diagnosis (FDD)

(iii) Design approaches: Active vs. Passive FTC

(iv) Representative FTC examples from the literature

(v) The role of Fault Detection and Isolation (FDI) in FTC systems

(vi) Fault estimation and the concept of bi-directional robustness in FTC

Lecture 2: Fault Monitoring in Open and Closed-Loop Systems – Robustness Challenges

This session will explore how robustness impacts fault detection in both open- and closed-loop control systems, with attention to modeling uncertainties and system resilience.

Lecture 3: Integrated Design Approaches for Robust Fault-Tolerant Control

The final lecture will focus on integrated FTC design methodologies that explicitly address robustness, offering strategies for unifying monitoring and control objectives in practical implementations.

Prof. Ron J. Patton

He graduated with BEng (E&EE), MEng (Control) and PhD (Control) degrees at the University of Sheffield UK (‘72,’74 & ’80). He was Lecturer at Sheffield Hallam (’78-’81), & York Universities (’81-’94), leaving York as Senior Lecturer to the Chair of Control & Intelligent Systems Engineering at Hull University in 1995, and is now Emeritus Professor. His life work includes mathematical modelling in Biology, ship positioning, fault diagnosis and fault tolerant flight/satellite control, and fault tolerant control for marine energy systems, with GS record of 33,167 citations (h72) (https://orcid.org/0000-0002-5490-3139). He was awarded IEEE Fellow in 2010, for contributions to ‘Robust Fault Diagnosis and Fault Tolerant Control’. (https://orcid.org/0000-0002-5490-3139). Ron is founder member of the IFAC TC Safeprocess (since 1990), leading Hull Safeprocess ’97 and was TC chair (’96-’02). He has co-authored/ authored books on Fault Diagnosis (4), Fault Tolerant Control (1) & Eigenstructure Assignment (1).
