

Department of Electrical and Computer Engineering

Title: «**Expert Vehicle Control at the Limits of Handling**»

Efstathios Velenis

Senior Lecturer at the Advanced Vehicle Engineering Centre - Cranfield University

Wednesday, 28th September 2016, 17:00 – 18:00

Room XOD02 – 117, New Campus – University of Cyprus

Abstract:

Expert race drivers employ specialised driving techniques to control a vehicle at the limits of tyre adhesion. Such techniques involve operation of the vehicle outside the stable envelope enforced by current active chassis control systems, such as the Antilock Brake System and Electronic Stability Control. In this seminar we present recent results in modelling and control of vehicle dynamics near the limits of handling towards understanding specialised race driving techniques and developing vehicle handling controllers with an extended operating envelope. Nonlinear programming optimisation is used to reproduce specialised race driving techniques and establish their optimality. Realistic characterisation of the nonlinear vehicle dynamics is used to develop optimal closed loop controllers to achieve stability in extreme operating regimes, mimicking the behaviour of expert human drivers. Exploiting the enhanced control authority available in modern vehicles, in particular through torque vectoring, we extend the application of the previous closed loop controllers towards the development of an active limit handling system. The proposed system aims to mitigate terminal understeer during over-speeding through a curve and allow the average driver exploit the full acceleration capacity of the vehicle.

Biography:

Efstathios Velenis is a Senior Lecturer at the Advanced Vehicle Engineering Centre at Cranfield University. He received his MSc and PhD degrees from the School of Aerospace Engineering at Georgia Institute of Technology, GA, USA in 2000 and 2006 respectively and his Mechanical Engineering Diploma from the Mechanical Engineering Department at the National Technical University of Athens in 1999. In 2006 he was awarded the Luther Long award for the best PhD dissertation in Engineering Mechanics at Georgia Institute of Technology. Following his PhD, Efstathios held a Post-doctoral researcher position at GeorgiaTech and was a visiting researcher at Ford Motor Company in MI, USA. Prior to joining Cranfield University, he held a lecturer position in Mechanical Engineering at Brunel University in the UK. Efstathios' research focuses on vehicle dynamics and control, optimal control for active chassis systems, braking and handling control for electric/hybrid vehicles, lap-time optimisation and tyre modelling. He has co-authored more than 50 journal and conference papers and received research funding from EPSRC, Innovate UK and the European Commission.