

Free Minor Control System Design - Applied Sciences

Delft University of Technology | Formula Student Team Delft

February 22, 2017

Introduction

Since 2012 Formula Student Team Delft has been building a four wheel driven (4wd) electric race car. Besides the advantage of being able to power all 4 tyres to aid acceleration it gives for another large advantage of being able to individually control the torque sent to each wheel. Chief among this system is something commonly known as traction control and anti block system, but also yaw acceleration and driving strategy is actively controlled during driving. The end goal is to allow the driver (a student from the team) to push/use the car closer to its theoretical limit.

Control system design combines simulation work (In matlab Simulink) with the study of vehicle dynamics, the study of how a vehicle will behave when pushed to the limit. Most control schemes are based on the fundamental physics principles found in Vehicle Dynamics. However, these work in a perfect world, where everything is precisely known at all times. The big challenge is to implement these control schemes in the car given a limited amount of inputs which each come with a certain amount of noise.

The minor student will get the responsibility to design and test the control systems of the car. The difficulty of this work, and the time required to successfully fulfil this task will be accredited to the 15 EC listed for this project. The assessment will be done by a final presentation, where focus should be put on the process applied and lessons learned. A paper needs to be written which will get a fail or pass result.

The idea behind the set-up of this minor is that several students working on different disciplines have 2 courses in common to ensure a basic level of understanding of project- and process management and decision making. This should enable the students to work more independently, while still performing as desired. The remaining ECTS will be gathered by following courses relevant for the discipline the student is working on, in this case Vehicle Dynamics Controls Design.

The work at the student will be doing at the team will involve him/her using techniques or knowledge learned in the following Applied Physics Bachelor: TN2545 (Systemen en Signalen) and TN2211 (Elektronische Instrumentatie). The proposed courses for this minor are:

Course	ECTS	Motivation	Period
SPM6102 Process Management and Decision Making	5	A well-structured process and good decision making are of vital importance in such a high-paced project as Formula Student.	Q2
CT3101 Project Management Basics	5	Project management skills are a big plus in such a complex, multidisciplinary project.	Q1
ME41100 Vehicle Dynamics	4	This course concentrates on main technical principles and aspects of vehicle construction and dynamic behaviour and its subsystems.	Q2
ME41060 Matlab in Engineering Dynamics	2	Matlab in Engineering Mechanics is an introductory course in technical computing, Matlab, and numerical methods. The emphasis is on informed use of mathematical software.	Q2