

Free Minor Theoretical Vehicle Design - Mechanical Engineering

Delft University of Technology | Formula Student Team Delft

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Introduction

Since 2011 Formula Student Team Delft has been building an electric powered race car. One of the goals of the team is to win all competitions they attend. This in turn requires the car to have a high theoretical performance. This is expressed in the ability of the vehicle to achieve high accelerations in longitudinal, lateral and yaw directions. These accelerations all come from the tyre road interaction the vehicle has.

Load distributions on the tyre, and placement of the tyre on tarmac are key performance features of the vehicle which not only influence the accelerations the vehicle can achieve but also the driveability of the vehicle. In racing terminology this is often expressed as over- or understeer.

How the tyre is loaded and placed during driving can be influenced by looking at the kinematics of the vehicle and its suspension system. The primary challenge is achieve the highest possible accelerations, whilst keeping the car driveable. It is possible to predict the behaviour of the vehicle using simulation software (Matlab Simulink or CATIA) and find the best solution for the vehicle being designed that year.

The minor students will get the responsibility to simulate part of dynamic behaviour of the vehicle. The difficulty of this work, and the time required to successfully fulfil this task will accredit to the 15 credits 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 a combination of structural and electrical design.

The courses (following page) suggested for the theoretical vehicle design minor are a combination of the following:

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 A	4	This course concentrates on main technical principles and aspects of vehicle construction and dynamic behaviour and its subsystems.	Q2
ME41060 Matlab in Engineering Mechanics	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