Vehicle Dynamics and Control

Programme course

6 credits

Fordonsdynamik med reglering

TSFS02

Valid from: 2017 Spring semester

Determined by
Board of Studies for Electrical
Engineering, Physics and Mathematics

Date determined
2017-01-25

Main field of study
Electrical Engineering, Mechanical Engineering

Course level
Second cycle

Advancement level
A1X

Course offered for
- Mechanical Engineering, M Sc in Engineering
- Applied Physics and Electrical Engineering - International, M Sc in Engineering
- Applied Physics and Electrical Engineering, M Sc in Engineering
- Computer Science and Engineering, M Sc in Engineering
- Information Technology, M Sc in Engineering

Entry requirements
Note: Admission requirements for non-programme students usually also include admission requirements for the programme and threshold requirements for progression within the programme, or corresponding.

Prerequisites
Automatic Control, Engineering Mechanics, and familiarity with Matlab/Simulink.

Intended learning outcomes
The course gives basic knowledge of a vehicles longitudinal and lateral dynamics, and the control systems that are used to give the vehicle desirable driving characteristics. After the course the student shall know how to:

- Exemplify and describe fundamental principles of vehicular dynamics.
- Describe technical solutions and control strategies.
- Analyse and solve problems within vehicular dynamics.
- Model, simulate, and evaluate problems within vehicular dynamics.
- Implement laboratory experiments and present the results in writing.

Course content

- Vehicle models: Vehicle dynamics including coordinates, chassis, suspension, stability analysis. Quarter-car and two-wheel models.
- Tire models: Slip, skid and slip angle. Camber and caster angle. Pacejka's Magic formula
- Vehicle properties: Steady-state handling, transient response and directional stability.
- Vehicle parameters and states: Methods to estimate e.g. speed, friction forces and side slip.
- Vehicle control: ABS, TRC and ESP systems. Active differentials and suspensions.
- Driver and road models: Models for road profiles and driver behaviour.

Teaching and working methods

The course is organized in lectures, problem solving and laboratory experiments.

Examination

LAB1	Laboratory work	2 credits	U, G
TEN1	Written examination	4 credits	U, 3, 4, 5

Grades

Four-grade scale, LiU, U, 3, 4, 5

Department

Institutionen för systemteknik

Director of Studies or equivalent

Johan Löfberg

Examiner

Jan Åslund

Course website and other links

http://www.fs.isy.liu.se/Edu/Courses/TSFS02/

Education components

Preliminary scheduled hours: 56 h
Recommended self-study hours: 104 h

Course literature

Additional literature

Books

J.Y. Wong, *Theory of Ground Vehicles* Wiley
Wiley

Compendia

Distributed extra material.

Common rules

Regulations (apply to LiU in its entirety)

The university is a government agency whose operations are regulated by legislation and ordinances, which include the Higher Education Act and the Higher Education Ordinance. In addition to legislation and ordinances, operations are subject to several policy documents. The Linköping University rule book collects currently valid decisions of a regulatory nature taken by the university board, the vice-chancellor and faculty/department boards.

LiU's rule book for education at first-cycle and second-cycle levels is available at http://styrdokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva.