Wahlmodule Vertiefung Vehicle Systems

Ride and Handling

1	Module Number	Study Programme	Semester	Offered in	Duration	Module Type	Workload (h)	ECTS Points
	3910	ASM	2	WS XSS	1 Semester	compulsory	240	8

2	Courses	Teaching and Learning Forms	Contact Time (SWS)	Contact Time (h)	Self-Study Time (h)	Language
	a) Handling	Lecture	4	60	120	Englisch
	b) Transmission Control	Lecture	4	60 [1 SWS = 15h]	[bitte nur Summe eintragen]	

3 **Learning Outcomes and Competences**

Once the module has been successfully completed, the students can...

Knowledge and Understanding

- ... develop an understanding of theory and methods in vehicle dynamics, with the focus on ride and handling properties
- ... estimate the effect of changing model parameters on ride and handling criteria

Use, Application and Generation of Knowledge

Use and Transfer

- ... analyze the performance characteristics for ride and handling

Scientific Innovation

- … apply scientific tools to the development of computer simulation models

Communication und Cooperation

- ... work together with electronic and software experts in the field of chassis control
- ... discuss new solutions for suspension systems with design engineers
- ... present technical contents in the field of suspension and handling technology and discuss them.

Scientific Self-Conception/ Professionalism

- *... justify the solution theoretically and methodically.*

4 **Contents**

c) Lecture Handling

terminology of vehicle handling, control loop ”driver-vehicle-environment”, demands on vehicle handling, planar kinematics of vehicle motion, linear (bicycle) model, under- and oversteer, steady state and transient test procedures, handling characteristics under normal driving conditions, analysis and discussion of vehicle dynamics and vehicle handling including a des- cription of the tire, nonlinear model, yaw velocity damping characteristics, effects of design parameters and the road/tire friction coefficient on handling performance

d) Lecture Suspension Modeling

terminology in multibody dynamics, kinematics of free bodies, force and tor- que elements, play and friction, Newton-Euler equations, constraint functi- ons, joints and linkages, flexible bodies, structure and functionality of multi- body codes, types of analysis, introduction into MSC.ADAMS, application in suspension modeling and simulation for ride, handling on uneven roads, and load case generation for durability

Lab projects: development of a simple multibody simulation blockset in Si- mulink, modeling and analysis of double wishbone and McPhersion suspen- sions in MSC.ADAMS, full vehicle simulations in MSC.ADSAMS/Car

5 Participation Requirements

	compulsory: no recommended: undergraduate course in mechanics (especially planar kinematics and kinetics of rigid bodies) fundamentals of automotive engineering including principles of chassis de- sign linear algebra including fundamental matrix calculus and eigenvalues Modul 103 Simulation and Control 1
6	**Examination Forms and Prerequisites for Awarding ECTS Points** Written Examination 120 Minutes
7	**Further Use of Module** Master Thesis
8	**Module Manager and Full-Time Lecturer** Prof. Thomas Schirle
9	**Literature** Schindler, E.: Fahrdynamik – Grundlagen des Lenkverhaltens und ihre Anwendung für Fahrzeugregelsysteme. expert verlag, 2007 Gillespie, T.D.: Fundamentals of Vehicle Dynamics. SAE Wong: Theory of Ground Vehicles. SAE Nikravesh, P. E.: Computer-Aided Analysis of Mechanical Systems. Prentice Hall 1988 MSC: ADAMS Documentaion and Tutorials
10	**Last Updated** 15.06.2019