

Vehicle Suspensions

Code: MK3GEPFJ08JG20-EN

ECTS Credit Points: 8

Evaluation: exam

Semester: 5th semester

Its prerequisite(s): Vehicle Suspensions

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 4+4

Topics:

Vehicle dynamic requirements against the suspension; types of wheel geometry and their typical values; wheel suspension geometry; motion analysis of the different types of suspensions. Structural elements of the suspension: wheel, axle stub, suspending rods, spring elements; construction analysing of the connecting points of the body; analysing the active and semi-active wheel suspensions. Structural and construction analysing of intelligent suspensions, their operation principal, research and developing directions.

Vehicle dynamic requirements against the steering; geometrical analysis of different steering systems; steering linkage; analysing the pole point. Structural elements of the steering system; axle stub and arm, connecting rods, push rods, joints, steering gear, steering column; construction analysis of the steering wheel; geometric and construction analysis of power steering units and all wheel steering systems; Structural and construction analysing of intelligent steering systems, their operation principal, research and developing directions.

Vehicle brake systems and the requirements against them; the most important correlation of seizing the hydraulic and pneumatic brake systems; ideal effective specific braking force distribution and adhesion diagram of twin-axes vehicle. The ideal and effective specific braking force characteristics of hydraulic and pneumatic brake systems. The construction and critical analysis of hydraulic brake systems and assembly units with special regard to the braking force controller. The construction and critical analysis of pneumatic brake systems and assembly units with special regard to the braking force controller. The ABS. Special brake systems, steady brake systems. Determining the brake testing parameters.

Laboratory and measuring:

Test-bench measuring: testing steering units, testing hydraulic and pneumatic brake systems.

Vehicle test-bench measuring: ABS, ESP systems, braking force distribution, checking the effects of changing brake parameters.

Writing measuring report of the tests.

Literature:

- John J. Dixon: Tires, Suspension and Handling (Second edition). SAE International, 1996.
- Don Knowles: Automobile Suspension System and Steering Classroom Manual, Publisher: Cengage Learning 2010.
- Sergio Savaresi Charles Poussot-Vassal Cristiano Spelta Olivier Senname Luc Dugard: Semi-Active Suspension Control Design for Vehicles, 2010. Hardcover ISBN: 9780080966786.
- Schnubel, Mark: Automotive Suspension & Steering Systems Shop Manual 2014. ISBN-13: 978-1285438122
- James D. Halderman: Automotive Brake Systems 1995. ISBN-13: 978-0134063126

Schedule

1st week Registration week

2nd week:

Lecture: Vehicle dynamic requirements against the suspension; types of wheel geometry and their typical values; structural elements of the suspension: wheel, axle stub, suspending rods

Practice: wheel suspension geometry; motion analysis of the different types of suspensions. Structural elements of the suspension: spring elements; construction analyzing of the connecting points of the body;

4th week:

Lecture: Structural and construction analyzing of intelligent suspensions

Practice: Intelligent suspensions, research and developing directions.

6th week:

Lecture: Structural elements of the steering system; axle stub and arm, connecting rods, push rods,

Practice: Structural elements of the steering system; joints, steering gear, steering column; construction analysis of the steering wheel; geometric and construction analysis of power steering units and all wheel steering systems

8th week: Mid-term test

9th week:

Lecture: The ideal effective specific braking force distribution and adhesion diagram of twin-axes vehicle

Practice: The ideal and effective specific braking force characteristics of hydraulic and pneumatic brake systems.

11th week:

Lecture: The ABS.

Practice: Test-bench measuring: testing steering units.

13th week:

3rd week:

Lecture: analyzing the active and semi-active wheel suspensions.

Practice: analyzing the active and semi-active wheel suspensions.

5th week:

Lecture: Vehicle dynamic requirements against the steering

Practice: geometrical analysis of different steering systems; steering linkage; analyzing the pole point.

7th week:

Lecture: Structural and construction analysing of intelligent steering systems. Vehicle brake systems and the requirements against them.

Practice: Operation principal of intelligent steering systems, research and developing directions. Correlations of seizing the hydraulic and pneumatic brake systems

10th week:

Lecture: The construction and critical analysis of hydraulic brake systems and assembly units with special regard to the braking force controller.

Practice: The construction and critical analysis of pneumatic brake systems and assembly units with special regard to the braking force controller.

12th week:

Lecture: Special brake systems, steady brake systems. Determining the brake testing parameters.

Practice: Test-bench measuring: testing hydraulic and pneumatic brake systems.

14th week:

Lecture: Energy management of hybrid drive systems I.

Practice: Vehicle test-bench measuring: ABS, ESP systems.

Lecture: Energy management of hybrid drive systems II.

Practice: Vehicle test-bench measuring: braking force distribution, checking the effects of changing brake parameters.

15th week: 2nd drawing week

Requirements

A, for a signature:

Attending **lectures** is recommended, but attending the **practices** is compulsory. Students must attend practice classes and may not miss more than three practice classes during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Students cannot take part in any practice class with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certification needs to be presented. Missed practice classes must be made up for at a later date, being discussed with the tutor. Students are required to bring the drawing tasks and drawing instruments for the course with them to each practice class. Active participation is evaluated by the instructor in every class. If a student's behavior or conduct does not meet the requirements of active participation, the teacher may evaluate their participation as an absence because of the lack of active participation in class.

Students have to **take part in laboratory measures** and submit the measuring reports minimum on a sufficient level.

During the semester there are two tests: the mid-term test in the 8th week and the end-term test in the 15th week. Students have to sit for the tests.

B, for a grade:

The course ends in an **examination**. Based on the average of the grades of the measuring reports and the examination, the exam grade is calculated as an average of them:

- the average grade of the measuring reports
- the result of the examination

The minimum requirement for the mid-term and end-term tests and the examination respectively is 60%. Based on the score of the tests separately, the grade for the tests and the examination is given according to the following table:

Score	Grade
0-59	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

If the score of any test is below 60, students can take a retake test in conformity with the EDUCATION AND EXAMINATION RULES AND REGULATIONS.