

1	Course Number	Study Program KEEP/INTAP	Semester 2-4	Offered in ☒WS, ☒SS	Duration 1 Semester	Course Type optional	Workload (h)	ECTS Points 4
2	Course Computer Simulation		Teaching and Learning Forms Lectures, practices and exam preparation		Contact Time (SWS) 4 (1h=45 min.) (h) 40		Self-Study Time (h) 20	Language English
3	Learning Outcomes and Competences After successfully completing the module, students will be able to ... Know and understand - ... the fundamentals of time domain simulation models, its weaknesses and strength Use, application and generation of knowledge <i>Use and transfer</i> - ... of how to model, mathematically describe, implement, apply and analyze time domain simulation models using Matlab/Simulink - ... based o - ... estimate typical magnitudes of fluid mechanical parameters and material properties. <i>Scientific innovation</i> - ... independently carry out optimizations and further developments of dynamic systems. Overarching competencies <i>Communication and Cooperation</i> - ... argue their point of view in technical discussions using simulation results <i>Methodological competence</i> - ... have learned to apply the concept of block-oriented modelling to describe the dynamics of an automotive system. - ... define test maneuvers and check the plausibility/validity of such a simulation model systematically. Scientific self-image/professionalism - ... the students can work independently on scientific and automotive projects featuring system dynamics challenges.							
4	Participation Requirements Desirable but not mandatory: Basic math (calculus, linear algebra) and computer programming and software usage skills.							
5	Course Contents (1 h = 45 min) - Simulation and simulation tools in automotive engineering (2 h) - Notation: processes, systems, models, state systems (2 h) - Mathematical modeling of a car suspension (1 h) - Introduction to MATLAB/SIMULINK (1 h) - Numerical aspects: integration methods, stability, accuracy, robustness (1 h) - treatment of nonlinearities (play, dry friction, stops etc.) (1 h)							

6	Laboratory Projects (1h = 45 min) One session per week with 4 hours per session (1h=45 min.). - Modeling, programming and simulation of a car suspension (4 h) - SIMULINK model of a car suspension (4 h) - SIMULINK S-Function for embedding of user defined models (4 h) - State Space form of car suspension LTI model (4 h) - Automatic linearization of nonlinear systems (4 h) - Modeling approaches for a nonlinear shockabsorber (4 h) "Skyhook" damping concept for active suspension systems (4 h) - Active suspension system with road preview (mechanics, hydraulics, control). Simulation of system performance: (4 h)
7	Examination Forms and Prerequisites for Awarding ECTS Points Midterm and final exam written examination 90 min., graded The exam is an open book exam and the students may use all documents in paper form (scripts and notes) and calculators.
8	Estimated Student Workload 40 hours
9	Further Use of Course Electrical Engineering, Mechatronics, Mechanical Engineering
10	Grading Scheme Total grade: 50% midterm exam and 50% final exam <i>Local grading scale Esslingen University:</i> 1,0/1,3 very good; 1,7/ 2,0/ 2,3 good; 2,7/3,0/3,3 satisfactory; 3,7/4,0 adequate; 4,3/4,7/5,0 insufficient/failed.
11	Course Manager and Full-Time Lecturer Prof. Dr.-Ing. Thomas Schirle
12	Literature Lecture scripts with notes, exam samples with solution, instructor provides exercises with solutions. Further reading: Matlab/Simulink simulation software: User manual and introduction/demos to to manual and demo
13	Course registration Due to the limited number of participants, we ask that you register in advance by emailing kremena.daneva@hs-esslingen.de . You may only participate after receiving confirmation of your registration.
14	Last Updated 30.04.2026