

Module description: Transportation Project 1	
Module Code	t.BA.MO.PM1.24HS
ECTS Credits	4
Language of Instruction/Examination	German
Organizational Unit	ICP
Module Coordinator	Kurt Pernstich
Legal Framework	The module description is part of the legal basis in addition to the general academic regulations. It is binding. During the first week of the semester a written and communicated supplement can specify the module description in more detail.
Module Characteristic	Type 4* 4 lab lessons per semester week and half-class
Module Description	In the Foundations Project 1 you first measure and analyse the movement of a train ride and then create a quarter car model to analyse simple driving dynamics scenarios. The work in Foundations Project 1 is under the motto "Measuring, Modelling, Communicating".
Module Content	<ul style="list-style-type: none"> • In the Foundations Project 1, you will work on two multi-week projects. In the first project, you will simulate a train journey using the OpenTrack software. Along with the motion data, you will also obtain information about the energy consumption of the locomotive. Starting from the acceleration of the train, you will independently calculate all other motion data as well as power and energy using Excel or Python. In doing so, you will apply integral and differential calculus from the Analysis module and deepen your understanding of physical principles from the Physics module. Project planning will help you work on the project in a structured manner, and you will also practically apply content from the Communications module. You will present your results in the form of a short written report. • In the second project, you work in a team, which makes project planning even more important. The aim of the project is to create a so-called quarter car model, with which simple driving dynamics scenarios can be analyzed, for example the effect of speed when driving over a speed bumper. To make modeling easier, you first perform measurements on cart on a track and then create a preliminary model that can be verified with measurements. Through your own research, you will find the parameters required to create the actual quarter car model. When modelling, you use methods and software tools, which were introduced in physics lessons. You analyze and evaluate the results of the simulation and communicate your findings in the form of a presentation.
Prerequisite Knowledge	

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Learning Objectives (Competences)	Students...		Competencies	Taxonomies	
	After the completion of the Basic Project 1 you can carry out measurements with various measuring instruments		F, M	K1, K2	
	... plan and carry out simple measurements and critically review the measurement results		F, M	K3, K4, K5, K6	
	... analyze and display measurement and simulation data (digital skills)		F, M	K4, K5, K6	
	... apply and improve the basics of project management in a hands-on project		M	K3	
	... work on a project in a team and actively shape and reflect on team behavior		SO, SE, M	K4, K5, K6	
	... expand your social and personal skills and develop a personal, reflected way of working		SE, SO	K5	
	... transfer knowledge from subject-specific subjects and applying it within the framework of a project work		F	K3	
	... divide a project task into sub-problems that can be solved computer-aided (computational thinking)		M, F	K4	
	... create a comprehensive dynamic model and research suitable model parameters or determine them by measurement		F, M	K3, K4, K5	
	... perform an optimization of model parameters and estimate the limits of applicability		F	K5	
	... carry out simulations and evaluate, interpret and present the results in a clear and concise manner		F, M	K3, K4, K5, K6	
... convincingly describe the measurements, the model and the simulations in a technical report		M, F	K4, K5, K6		
Performance Assessment	End-of-module exam	Assessment	Length (min.)	Weighting	Form
	written + oral	Grade		75	acc. to module agreement
	Performance assessment during the semester	Assessment	Length (min.)	Weighting	Form
	written + oral	Grade		25	acc. to module agreement
Classroom Attendance Requirement	None				
Learning material					
Comments	<ul style="list-style-type: none"> • Written and oral instructions on the individual tasks • blackboard sketches • handouts • self-study documents • source code • measuring instruments and experimental set-ups 				

