Module DDM 4208 - Design and Development 2

1	Module Number	Study Programme	Semester	Offered in	Duration	Module Type	Workload (h)	ECTS Points
	4208	DDM	2	☐WS ☒SS	1 Semester	compulsory	120	4

2	Courses	Teaching and Learning Forms	Contact Time (SWS)	Contact Time (h)	Self-Study Time (h)	Language
	a) Advanced CAD	Lecture	2	30	60	English
	b) Design of Experiments	Lecture	2	30		

3 **Learning Outcomes and Competences**

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

Knowledge and Understanding

- Get a deeper practical and theoretical insight into the various modules of a CAD system.
- Possibilities of a parametric system, such as programming and automated modelling.
- Extensive knowledge of data exchange
- Extensive knowledge to generate surface models.
- Explain the basic procedure of the DOE and understand the connections within the DOE.
- Describe and use different applications of DOE-methods.
- Transfer the knowledge from theory of DOE to practical tests.
- Understand and explain the importance of planning effective tests.

Use, Application and Generation of Knowledge

Use and Transfer

- Knowledge and practice in handling a parametric and history / non-based CAD systems
- Knowledge and practice of automated feature generation and programming
- Knowledge and application of various simulation tools
- Knowledge in the specifics by creation of surface models
- Knowledge about capabilities of modern CAD systems
- Create designs based on given requirements and boundary conditions.
- Understand the basics of the application of DOE methods.
- Analyse performed tests and derive mathematical models to develop solutions.
- Reflect findings from the experiments into the design.

Scientific Innovation

- Programme model generation by creation of family tables.
- Structure and engineering approach to creating CAD models and assemblies
- Set up hypothesis tests.
- Create statistical tests, derive new models and optimize design or simulation tasks.
- Use methods and tools to gain new insights in the area of optimization and reliability of virtual simulation models or real product behaviours.

Communication and Cooperation

- Interpret results of simulations based on special leads.
- Use learned knowledge, skills and competences to model complex geometry well-structured and with high quality requirements
- Interpret the results of the evaluated DOE, make suggestions for optimization due to reliability and draw admissible conclusions.
- Use the learned knowledge, skills and competences to evaluate the DOE and interpret them according to other aspects.
- Present the derived models and discuss them within the development team.

Scientific Self-Conception/ Professionalism

- Select CAD systems based on learned criteria
- Decide how to model complex geometry economically and with high quality requirements
- Select and use data exchange formats
- Derive recommendations for decisions from a technical perspective on the basis of the analyses and evaluations made.
- Justify the solution theoretically and methodically.

4	**Contents** a) Advanced CAD: General introduction in the latest Revision CREO from PTC with practices; Learning of special advanced features of a CAD system; Learning of special advanced modules of a CAD system, like sheet metal, surface, mechanism, cabling and piping. Several programing tools and possibilities; Criteria for choosing a CAD System; Subassembly and skeleton technology; CAD and Internet; Data exchange, direct and indirect data exchange; Many practice by using the CAD-System by working out examples; Theoretical background of CAD-System modules. b) Design of Experiments: General introduction into DOE, differences to experience-based test planning, execution and results of a DOE; Attempts plan: selection parameters to be investigated and result sizes, establishing the testing area; Test plan designs: Overview DOE designs (factorial, response surface, mixture, optimal designs), selection of designs; Creating designs with a DOE software tool; Specific variables in the DOE: randomization, blocks replication, resolution / confounding; Evaluation of experimental design results: effects and effect size, interactions, statistical tests in the DOE, review the validity; Optimization calculation, prediction and confirmation tests: graphical representation of the effects of parameters, numerical optimization, predict outcomes, evaluation of test results; Application of the DOE to some practical examples as well to a final exercise with all the main points mentioned
5	**Participation Requirements** Compulsory: Bachelor Degree in Automotive or Mechanical Engineering Recommended: Basic knowledge and education in CAD system
6	**Examination Forms and Prerequisites for Awarding ECTS Points** Advanced CAD: Several attestations, graded Design of Experiments: Written exam 60 min, graded
7	**Further use of Module** NA
8	**Module Manager and Full-Time Lecturer** Responsible: Prof. Dr.-Ing. Alexander Friedrich Lecturer: Dipl.-Ing. Ulrike Schwanke, Dr.-Ing. Stefan Kemmler
9	**Literature** Lecture Documents; textbook references will be given in the lecture, Power point presentations
10	**Last Updated** 18.04.2021