Module DDM 4214 – Design and Development 1

1	Module Number	Study Programme	Semester	Offered in	Duration	Module Type	Workload (h)	ECTS Points
	4214	DDM	1	☒WS ☐SS	1 Semester	compulsory	180	6

2	Courses	Teaching and Learning Forms	Contact Time (SWS)	Contact Time (h)	Self-Study Time (h)	Language
	a) Design Methodology Case Study	Lecture	2	10	110	English
	b) Ecologic and Economic Design	Lecture	2	30		
	c) Reliability	Lecture	2	30		

3 **Learning Outcomes and Competences**

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

Knowledge and Understanding

- Understand and explain the concepts and principles of ecologic and economic design.
- Describe the product development process.
- Understand the basics of reliability engineering.

Use, Application and Generation of Knowledge

Use and Transfer

- Apply the concepts and principles of ecologic and economic design in their own projects and processes.
- Take different perspectives and points of view on a given situation, weigh them up against each other and choose the best design or process with respect to ecologic and economic aspects.
- Use the methods and concepts of reliability engineering.
- Calculate reliability characteristics.
- Familiarize themselves with new ideas and topics based on their basic knowledge in reliability.

Scientific Innovation

- Improve the design of engineering concepts and processes in order to improve their ecologic and economic aspects and their reliability.

Communication and Cooperation

- Communicate actively within an organization and obtain information about ecologic and economic design Aspects.
- Communicate and cooperate within the group in order to find adequate solutions for ecologic and economic design aspects and their reliability (e.g. FMEA).
- Interpret the results of the reliability assessments and draw admissible conclusions.
- Use the learned knowledge, skills and competences to evaluate the reliability and interpret the results according to other aspects.
- Present reliability contents and discuss them.

Scientific Self-Conception/ Professionalism

- Derive recommendations for decisions from a ecologic and economic perspective on the basis of the analyses and evaluations made.
- Justify the results of reliability analysis theoretically and methodically.

4 **Contents**

a) Design Methodology Case Study: Design constraints, QCD requirements, design and development Team, breakdown structures, functional decomposition of technical systems, product design specification, V – Cycle, tender and project cost management, change and configuration Management, safety management and engineering

b) Ecologic and Economic Design: Resources, future resource availability, negative effects of industrial processes and products on humans and the environment, environmental burden of disease in Europe, EU directives on environmental protection (design engineering view), ECO-design methods including Luttrop's "Golden Rules and additions", ecological design and economic design - no area of conflict!

c) Reliability: Definition, significance and overview of reliability, techniques in the product development and in the product life cycle; statistics, probability theory, life time distribution, reliability of systems; FMEA, Boolean system theory; proof of reliability, planning of tests, collecting field data; reliability software;

5	**Participation Requirements** Compulsory: Fundamentals of strength of materials, engineering mechanics and material science. Mathematics: Basic knowledge of statistics. Fundamentals of automotive engineering Recommended: design technology, engineering mathematics
6	**Examination Forms and Prerequisites for Awarding ECTS Points** Design Methodology Case Study: Certificate Ecologic and Economic Design: Written exam 90 minutes (closed) Reliability: Written exam 60 minutes (open)
7	**Further use of Module** Design and Development 2 incl. Design of Experiments
8	**Module Manager and Full-Time Lecturer** Responsible: Prof. Dr.-Ing. Alexander Friedrich Lecturer: Prof. Dr.-Ing. Alexander Friedrich, Prof. Dr.-Ing. Tobias Leopold
9	**Literature** Eberhard Abele, Reiner Anderl, Herbert Birkhofer, Bruno Rüttinger: EcoDesign - Von der Theorie in die Praxis; Springer Berlin Heidelberg, 2008 Alessandro Freddi, Mario Salmon: Design Principles and Methodologies - From Conceptualization to First Prototyping with Examples and Case Studies; Springer International Publishing AG, part of Springer Nature 2019 Bertsche, Bernd: Reliability in Automotive and Mechanical Engineering, Springer, Berlin, 2008
10	**Last Updated** 08.06.2021