GENERAL INFORMATION					
Subject name	TR3. Advanced Simulation & Modelling				
Semester	1	Character	Compulsory	Type of module	Transversal
ECTS	6		Modality	Blended	
Higher Education Institution(s)			FHJ, MU		
Lecturer(s)			Georg Wagner David Schneider Joseba Mendiguren		

LEARNING AND TEACHING	
ESCO Occupation(s)	Calculation engineer
ESCO Skill & Competences (*no ESCO)	Computational mechanics Digital twin technology" Use CAD software Use CAE software Engineering principles
Learning outcomes	KU1 EP2 EP4
Teaching methods	Seminars Simulation-Based Learning Case Studies Collaborative and Problem-Based Learning (PBL)
Assessment methods	Simulations and modelling exercises Case studies Technical reports (short)

CONTENTS
Previous requirements (if necessary)
None
Content index

1. Virtual product design
   - Parametric 3D modelling
   - Topology optimisation
   - CAD data exchange
   - Optional: Virtual Reality integration with CAD
2. Virtual manufacturing simulation
   - Fundamentals of Finite Element Method (Element type and mesh generation, Finite Element formulation, Assembly and solution techniques)
   - Boundary conditions and constraints
   - Materials properties and constitutive models
3. Non-parametric models
   - Digital twins
   - Surrogate models
   - Metamodels

- Modelling tools (Python, DoE)

SUPPORTING BIBLIOGRAPHIC REFERENCES

Lecture notes; handouts; Literature (as well available in English):
H. Vogel: Konstruieren mit SolidWorks; S. Vajna: SolidWorks - kurz und bündig; P. Tran: SOLIDWORKS Basic Tools; P. Tran: SOLIDWORKS Intermediate Skills; P. Tran: Certified SOLIDWORKS Professional Advanced Preparation Materials; M. Lombard: SolidWorks Surfacing and Complex Shape Modeling Bible; V. Gaurav: SolidWorks 2019 Black Book; DIN e.V.: Technische Dokumentation: Normen für technische Produktdokumentation und Dokumentenmanagement (DIN-VDE-Taschenbuch); G. Hoenow: Entwerfen und Gestalten im Maschinenbau: Bauteile - Baugruppen - Maschinen; G. Hoenow: Konstruktionspraxis im Maschinenbau: Vom Einzelteil zum Maschinendesign; F. Rieg: Handbuch Konstruktion; M. Eigner. D. Roubanov, R. Zafirow: Modellbasierte virtuelle Produktentwicklung; VDI-Verlag: VDI-Richtlinie 2215 - Datenverarbeitung in der Konstruktion;
F. Rieg, R. Hackenschmidt, B. Alber-Laukant : Finite Elemente Analyse für Ingenieure; M. Brand: FEM-Praxis mit SolidWorks: Simulation durch Kontrollrechnung und Messung verifizieren; V. Krämer: Praxishandbuch Simulationen in SolidWorks 2010: Strukturanalyse (FEM), Kinematik/Kinetik, Strömungssimulation (CFD); R. Schwarze: CFD-Modellierung; A. M. Law: Simulation Modeling and Analysis; U. S. Dixit, R. Kant: Simulations for Design and Manufacturing; V. Ivanov, Y. Rong, J. Trojanowska, J. Venus, o. Liaposhchenko, J. Zajac, I. Pavlenko, M. Edl, D. Perakovic: Advances in Design, Simulation and Manufacturing;

SOFTWARE

SolidWorks® (CAD, FEA, Motion, CFD, Plastics) incl. CAM
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- could be provided by FHJ

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