

ME121 - Complex Automation Systems

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General information	
Module Code	ME121
Unique Identifier	KomplSysAuto-01-MA-M
Module Leader	Prof. Dr. Wree, Christoph (christoph.wree@haw-kiel.de)
Lecturer(s)	
Offered in Semester	Sommersemester 2027
Module duration	1 Semester
Occurrence frequency	Regular
Module occurrence	In der Regel im Sommersemester
Language	Englisch
Recommended for international students	Yes
Can be attended with different study programme	No

Curricular relevance (according to examination regulations)
Study Subject: M.Eng. - BT - Battery Technologies Module type: Pflichtmodul Semester: 1 , 2

Qualification outcome
<i>Areas of Competence: Knowledge and Understanding; Use, application and generation of knowledge; Communication and cooperation; Scientific self-understanding / professionalism.</i>
Students are able to apply concepts and methods for the structured design of complex automation systems (AS).
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Students can discuss, solve and coherently explain complex technical problems in a team.
Students can - define goals for learning and work processes, - recognize, describe and explain requirements.

Content information

Content	<p>Lecture content:</p> <p>Important standards for the design of automation systems (AS)</p> <p>Procedure models for the design of AS</p> <p>Possibilities of system modeling and simulation for IEC 61131-based AS</p> <p>Agent-oriented software development for IEC 61131-based AS</p> <p>Coordination of parallel processes with Petri nets</p> <p>Motion planning for production cells</p> <p>Mechanisms for identifying workpieces (vision, RFID)</p> <p>Machine learning for AS</p> <p>Cloud-based services for AS</p> <p>Condition monitoring</p> <p>Virtual reality and augmented reality for AS</p> <p>AS for battery production (production machines for lithium-ion battery cells: laser cutting, welding, ablation machines; composite foil formation machines; filling and soaking process machines; degassing and sealing machines; module manufacturing machines; testing and inline process monitoring machines)</p> <p>Laboratory content:</p> <p>Programming of roll-to-roll foil transport system (TwinCAT)</p> <p>PLC-based programming of a delta robot (TwinCAT)</p> <p>Virtual commissioning of a delta robot in 3D (TwinCAT, Unity)</p> <p>Programming of a production cell with transport system (Beckhoff XTS, TwinCAT)</p> <p>Machine vision (TwinCAT Vision)</p> <p>Object classification with machine learning (TwinCAT ML)</p>
Literature	<p>Vogel-Heuser, B., Bauernhansl, T., & ten Hompel, M. (eds.). Handbuch Industrie 4.0 [Handbook Industry 4.0]. Springer Vieweg.</p> <p>Hippenmeyer, H., & Moosmann, T. Automatische Identifikation für Industrie 4.0 [Automatic Identification for Industry 4.0]. Springer Vieweg.</p> <p>Bindel, T., & Hofmann, D. Projektierung von Automatisierungsanlagen [Design and Engineering of Automation Systems]. Springer Vieweg.</p> <p>Göhner, P. (ed.). Agentensysteme in der Automatisierungstechnik [Multi-Agent Systems in Automation Technology]. Springer.</p> <p>Lunze, J. Automatisierungstechnik [Automation Technology]. De Gruyter Oldenbourg</p>

Workload

Number of SWS	4 SWS
Credits	5,00 Credits
Contact hours	48 Hours
Self study	102 Hours

Module Examination

Examination prerequisites according to exam regulations	None
ME121 - Laborprüfung	<p>Method of Examination: Laborprüfung</p> <p>Weighting: 0%</p> <p>wird angerechnet gem. § 11 Absatz 2 PVO: Yes</p> <p>Graded: No</p> <p>Remark: Successful completion of all 6 laboratory experiments is required to pass the module.</p>

ME121 - Technischer Test	Method of Examination: Technischer Test Duration: 90 Minutes Weighting: 100% wird angerechnet gem. § 11 Absatz 2 PVO: No Graded: Yes
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Miscellaneous	
Recommended Prerequisites	PLC programming knowledge is required