MK119 - Unterwasser Techniken

MK119 - Underwater Techniques

General information	
Module Code	MK119
Unique Identifier	UnderwTechn-01-MA-M
Module Leader(s)	Prof. Dr. Badri-Höher, Sabah (sabah.badri-hoeher@haw-kiel.de)
Lecturer(s)	Prof. Dr. Badri-Höher, Sabah (sabah.badri-hoeher@haw-kiel.de)
Offered in Semester	Sommersemester 2020
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	Yes

Curricular relevance (according to examination regulations)
Study Subject: M.Eng. - MET - Elektrische Technologien (PO 2017, V3) Study Specialization: Mechatronik Module type: Wahlmodul Semester: 1, 2
Study Subject: M.Eng. - MET - Elektrische Technologien (PO 2017, V3) Study Specialization: Kommunikationstechnik und Embedded Systems Module type: Wahlmodul Semester: 1, 2
Study Subject: M.Sc. - MIE - Information Engineering (PO 2022, V3) Study Specialization: Information Technology and Systems Module type: Wahlmodul Semester: 1, 2, 3
Study Subject: M.Sc. - MIE - Information Engineering (PO 2022, V3) Study Specialization: Intelligent Systems Module type: Wahlmodul Semester: 1, 2, 3

Qualification outcome
Areas of Competence: Knowledge and Understanding; Use, application and generation of knowledge; Communication and cooperation; Scientific self-understanding / professionalism.
Technical skills (Expertise) The main subjects of this course are: - Underwater sound propagation - Underwater acoustical data transmission - Underwater navigation and localization techniques - Sonar signal processing algorithms and their implementation in software.

The students - obtain specialized knowledge in the field of underwater sound transmission and detection matched to the master level in the area of electrical and information engineering - acquire skills to understand modern navigation and localization techniques. Sonal signal processing, underwater acoustical data transmission.
The course covers elements of a classical interactive online lecture/exercise, as well as team-working based on the handling of scientific papers and lab work. Therefore the students learn to solve problems both independently as well as team-oriented.
The students - learn to communicate in teams about scientific contents - learn to express and justify their opinion about suitable problem solutions in projects of underwater techniques.

Content information	
Content	Properties of sound in water: Absorption, scattering, multipath propagation, natural and artificial noise sources. Underwater acoustic positioning systems: Long-baseline (LBL), short-baseline (SBL), ultra-short-baseline (USBL), GPS intelligent buoys (GIB). Sonar principles: Sonar equation, single-beam and multi-beam sonar systems, beamforming Sonar signal processing: Localization and tracking of objects by means of 1D and 2D sonar signals. Sonar-based navigation, simultaneous localization and mapping (SLAM).
Literature	L. Brekhovskikh, Y Lysanov, Fundamentals of Ocean Acoustics. Springer, 2003. W. S. Burdic, Underwater acoustic system analysis. Prentice Hall, 1991. X. Lurton, An Introduction to Underwater Acoustics: Principles and Applications. Springer Praxis Publishing, London, 2010. D. Ribas, P. Ridao, J. Neira, Underwater SLAM for Structured Environments Using an Imaging Sonar. Springer, 2010.

Teaching formats of the courses	
Teaching format	**SWS**
Übung	1
Lehrvortrag	2
Labor	1

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

MK119 - Übung	Method of Examination: Übung Weighting: 30% wird angerechnet gem. § 11 Absatz 2 PVO: Yes Graded: Yes
MK119 - Klausur	Method of Examination: Klausur Duration: 90 Minutes Weighting: 70% wird angerechnet gem. § 11 Absatz 2 PVO: Yes Graded: Yes

Miscellaneous	
Miscellaneous	Students are asked to bring their own laptops to the laboratory classes. Laboratory assignments are encouraged to be solved in teams of two or three students. This module takes place in the technical faculty of the university of Kiel (CAU)