

## MK119 - Unterwasser Techniken

## MK119 - Underwater Techniques

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<b>General information</b>	
<b>Module Code</b>	MK119
<b>Unique Identifier</b>	UnderwTechn-01-MA-M
<b>Module Leader(s)</b>	Prof. Dr. Badri-Höher, Sabah (sabah.badri-hoeher@haw-kiel.de)
<b>Lecturer(s)</b>	Prof. Dr. Badri-Höher, Sabah (sabah.badri-hoeher@haw-kiel.de)
<b>Offered in Semester</b>	Sommersemester 2026
<b>Module duration</b>	1 Semester
<b>Occurrence frequency</b>	Regular
<b>Module occurrence</b>	In der Regel im Sommersemester
<b>Language</b>	Englisch
<b>Recommended for international students</b>	Yes
<b>Can be attended with different study programme</b>	Yes

<b>Curricular relevance (according to examination regulations)</b>
Study Subject: M.Eng. - MET - Elektrische Technologien (PO 2017, V3) 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.Eng. - MET - Elektrische Technologien (PO 2025, V20261) Module type: Wahlmodul Semester: 1, 2
Study Subject: M.Sc. - MCS - Computer Science (PO 2023, V1) Module type: Wahlmodul Semester: 1, 2
Study Subject: M.Sc. - MIE - Information Engineering (PO 2022, V3) Module type: Wahlmodul Semester: 1, 2, 3

<b>Qualification outcome</b>
<i>Areas of Competence: Knowledge and Understanding; Use, application and generation of knowledge; Communication and cooperation; Scientific self-understanding / professionalism.</i>
Technical skills (Expertise) The main subjects of this course are: <ul style="list-style-type: none"> <li>- Underwater sound propagation</li> <li>- Underwater acoustical data transmission</li> <li>- Underwater navigation and localization techniques</li> <li>- Sonar signal processing algorithms and their implementation in software.</li> </ul>

<p>The students</p> <ul style="list-style-type: none"> <li>- 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</li> <li>- acquire skills to understand modern navigation and localization techniques. Sonar signal processing, underwater acoustical data transmission.</li> </ul>
<p>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.</p>
<p>The students</p> <ul style="list-style-type: none"> <li>- learn to communicate in teams about scientific contents</li> <li>- learn to express and justify their opinion about suitable problem solutions in projects of underwater techniques.</li> </ul>

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

<b>Teaching formats of the courses</b>	
<b>Teaching format</b>	<b>SWS</b>
Lehrvortrag	2
Übung	1
Labor	1

<b>Workload</b>	
<b>Number of SWS</b>	4 SWS
<b>Credits</b>	5,00 Credits
<b>Contact hours</b>	48 Hours
<b>Self study</b>	102 Hours

<b>Module Examination</b>	
<b>Examination prerequisites according to exam regulations</b>	None

<b>MK119 - Übung</b>	Method of Examination: Übung Weighting: 30% wird angerechnet gem. § 11 Absatz 2 PVO: No Graded: Yes
<b>MK119 - Klausur</b>	Method of Examination: Klausur Duration: 90 Minutes Weighting: 70% wird angerechnet gem. § 11 Absatz 2 PVO: No Graded: Yes

<b>Miscellaneous</b>	
<b>Miscellaneous</b>	<p>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.</p> <p>This module takes place in the technical faculty of the university of Kiel (CAU)</p>