

## Courses in English Course Description

<b>Department</b>	04 Electrical Engineering and Information Technology
<b>Course title</b>	<b>Batteries and Fuel Cells</b>
<b>Hours per week (SWS)</b>	3
<b>Number of ECTS credits</b>	5
<b>Course objective</b>	<ul style="list-style-type: none"> <li>• Technological overview of fuel cells, their classification and different properties. Requirements for operation, factors influencing power density, efficiency and costs.</li> <li>• Technological overview of modern and future battery systems, especially high-temperature batteries (NaS, NaNiCl<sub>2</sub>) and redox flow batteries (vanadium systems and alternatives).</li> <li>• In-depth study of the topic of lithium batteries, particularly with regard to future trends (5V materials, lithium sulphur, lithium-air).</li> <li>• Modern electrotechnical analysis methods for batteries and fuel cells, especially the electrochemical impedance spectroscopy and models derived from it. Development of equivalent circuit models and their parameterization via measurements.</li> <li>• Modern model-based methods for determining the condition of batteries and fuel cells.</li> <li>• Deepening of the understanding of fuel cells and batteries as well as their analysis methods and modeling through three laboratory practicals</li> </ul>
<b>Prerequisites</b>	Recommended: Basic knowledge of electrical energy storage
<b>Recommended reading</b>	<p>Jossen, A. &amp; Weydanz, W. Moderne Akkumulatoren richtig einsetzen, Inge Reichardt Verlag, 2006</p> <p>Linden, D. &amp; Reddy, T. B. (ed.) Handbook of batteries McGraw-Hill Professional, 2001</p> <p>Korthauer, R. (ed.): Handbuch Lithium-Ionen-Batterien, Springer Vieweg, 2013, ISBN 978-3-642-30653-2</p> <p>Kurzweil, P.: Brennstoffzellentechnik: Grundlagen, Komponenten, Systeme, Anwendungen, Vieweg+Teubner Verlag; Auflage: 2003, ISBN-13: 978-3528039653</p> <p>Vielstich, W., Lamm, A. (ed.): Handbook of Fuel Cells: Fundamentals, Technology, Applications, John Wiley &amp; Sons; Auflage: 1 (2003), ISBN-13: 978-0471499268</p>
<b>Teaching methods</b>	Seminar-based instruction with integrated exercises/integrated internship
<b>Assessment methods</b>	Written exam, 90 min
<b>Language of instruction</b>	English
<b>Name of lecturer</b>	Prof. Dr. Oliver Bohlen
<b>Email</b>	<a href="mailto:oliver.bohlen@hm.edu">oliver.bohlen@hm.edu</a>
<b>Link</b>	<a href="https://www.ee.hm.edu/fk04/profs/bohlen.de.html">https://www.ee.hm.edu/fk04/profs/bohlen.de.html</a>
<b>Course content</b>	See handbook for the master program "Elektrotechnik", <a href="https://www.ee.hm.edu/studium_allgemein/modulhandbuecher/modulhandbuecher_1.de.html">https://www.ee.hm.edu/studium_allgemein/modulhandbuecher/modulhandbuecher_1.de.html</a>
<b>Remarks</b>	