

Valid from 2026.HS

<b>Module description: Electrical Machines and Drives</b>	
<b>Module Code</b>	t.BA.MT.EMA.27HS
<b>ECTS Credits</b>	4
<b>Language of Instruction/Examination</b>	German
<b>Organizational Unit</b>	IMS
<b>Module Coordinator</b>	Hanna Putzi-Plesko
<b>Legal Framework</b>	The module description is part of the legal basis in addition to the general academic regulations. It is binding. During the first week of the semester a written and communicated supplement can specify the module description in more detail.
<b>Module Characteristic</b>	Type 3b  2 lecture lessons per semester week and class+ 4 lab bi-weekly lessons per semester and half-class
<b>Module Description</b>	The module Electrical Machines and Drives provides the fundamental knowledge of electrical machines that forms part of the core competence of every mechanical engineer. The course covers the construction, operating principles, and performance characteristics of DC, synchronous, and induction machines. A particular focus is placed on the design and dimensioning of electrical machines as well as their behavior under different load conditions. In addition, efficiency, losses, and basic thermal aspects are addressed. The module is complemented by the essential fundamentals of drive technology, especially the interaction between electrical machines, power electronics, and control systems.
<b>Module Content</b>	<ul style="list-style-type: none"> <li>• Fundamentals of Electrical Engineering: Electrical quantities (voltage, current, power), Ohm's law, resistance, basic DC and AC circuits, series and parallel connections, fundamentals of power calculation.</li> <li>• Fundamentals of Electrical Machines: Electromagnetic laws, force and torque production, electromagnetic induction, magnetic circuits, losses and thermal effects.</li> <li>• DC Machines: Construction, operating principles, characteristic curves, operational behavior, torque-speed characteristics, operating modes, and typical applications.</li> <li>• Induction Machines: Construction, equivalent circuit, rotating magnetic field and slip, operating characteristics, starting methods, losses, and efficiency.</li> <li>• Synchronous Machines: Construction, excitation methods, operating behavior, torque production, characteristic curves, and fields of application.</li> <li>• Design and Dimensioning of Electrical Machines: Power, torque, and speed requirements, thermal aspects, duty types, and selection criteria.</li> <li>• Power Electronics in Drive Systems: Fundamentals of rectifiers and frequency converters, interaction with synchronous and induction machines.</li> <li>• Electrical Drive Systems: System-level view of machine, power electronics, and control; typical industrial applications.</li> </ul>

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<b>Learning Objectives (Competencies)</b>	<b>Students...</b>			<b>Competencies</b>	<b>Taxonomies</b>	
	Students know the fundamental electrical quantities and laws (e.g., Ohm's law, electrical power, series and parallel circuits) and are able to analyze simple electrical networks.			M, F	K1, K3	
	Students are able to explain and compare the construction, operating behavior, and characteristic curves of DC, induction, and synchronous machines.			F, M	K2, K3	
	Students are capable of selecting and performing a basic dimensioning of electrical machines based on given requirements (torque, speed, power, duty type).			F, M	K3, K4	
	Students understand the interaction between electrical machines, power electronics, and control systems in drive applications and can analyze simple drive systems.			F, M	K2, K3	
	Students understand the physical principles of electromagnetic energy conversion and can explain the operating principles of electrical machines.			F	K2	
<b>Performance Assessment</b>	<b>End-of-module exam</b>	<b>Assessment</b>	<b>Length (min.)</b>	<b>Weighting</b>	<b>Social Form</b>	<b>Scenario/Format</b>
	written exam	Grade	60	60%	acc. to module agreement	
		<b>Assessment</b>	<b>Length (min.)</b>	<b>Weighting</b>	<b>Social Form</b>	<b>Scenario/Format</b>
	written exam	Grade		20%	acc. to module agreement	
	Quizzes <i>Weekly quizzes during the semester; one overall grade.</i>	Grade		10%	acc. to module agreement	
report	Grade		10%	acc. to module agreement		
<b>Classroom Attendance Requirement</b>	None					