

1	Course Number	Study Programme INTAP	Semester 3-7	Offered in <input checked="" type="checkbox"/> WS	Duration 1 Semester	Course Type optional	Workload (h)	ECTS Points 4
2	Courses		Teaching and Learning Forms Lectures, practices and exam preparation		Contact Time (SWS) (h) 4 40 (1h=45 min.)		Self-Study Time (h) 20	Language English
3	<p>Learning outcomes and competences After successfully completing the module, students will be able to ...</p> <p>Know and understand</p> <ul style="list-style-type: none"> - ... recognize all types of vehicle transmissions and understand their functional scope - ... recognize and justify the most important engine concepts - ... describe the design of important components - ... describe functional groups and their influence - ... understand and describe power flow in drive trains - ... describe system optimization for electric drives - ... describe operating strategies for hybrid vehicles - ... describe thermal interactions in the powertrain - ... know and understand common and special drive structures <p>Use, application and generation of knowledge</p> <p>Use and transfer</p> <ul style="list-style-type: none"> - ... Carry out basic design of electric drives - ... Carry out control of electric drives. - ... Perform optimization calculations for conventional, electric and electrified powertrains. - ... Perform control of the entire drive system. <p>Scientific innovation</p> <ul style="list-style-type: none"> - ... analyze measurement results from laboratory tests on the engine test bench. - ... Design operating strategies and interpret their effect on the overall system. - ... Analyze longitudinal dynamic parameters of powertrains. <p>Scientific self-image/professionalism</p> <ul style="list-style-type: none"> - ... justify the developed solution theoretically and methodically. - ... reflect and assess their own abilities in a group comparison. - ... prepare an engineering test report. 							
4	<p>Course contents</p> <p>Part 1 Basics on components</p> <ul style="list-style-type: none"> • Vehicle performance: Demands for drivelines • Propulsion Systems Basics • Electrical Systems • Gearboxes and Components • Combustion Engines • Powertrain Simulation using Matlab/Simulink <p>Part 2 Powertrain Development</p> <ul style="list-style-type: none"> • ICE-driven Propulsion Systems • Hybrid Propulsion Systems • Pure Electric Propulsion Systems 							
5	<p>Participation Requirements</p> <ul style="list-style-type: none"> • Basic knowledge on engines, electrical drives and gearboxes • Basic knowledge in mechanical design • Basic knowledge in electrical engineering 							

6	<p>Course calendar</p> <table border="0"> <thead> <tr> <th></th> <th>Section 1</th> <th>Section 2</th> </tr> </thead> <tbody> <tr> <td>Week 1</td> <td>Hybrid Structures Energy and CO2-</td> <td>Hybrid Structures Energy and CO2-</td> </tr> <tr> <td>Week 2</td> <td>equivalents</td> <td>equivalents</td> </tr> <tr> <td>Week 3</td> <td>Homologation Electrical</td> <td>Exercises</td> </tr> <tr> <td>Week 4</td> <td>Components</td> <td>Analogy Analysis</td> </tr> <tr> <td>Week 5</td> <td>Operating Strategy</td> <td>Repetition</td> </tr> <tr> <td>Week 6</td> <td>mid-term Operating</td> <td></td> </tr> <tr> <td>Week 7</td> <td>Strategies II Thermal</td> <td>Exercises</td> </tr> <tr> <td>Week 8</td> <td>Management Combustion</td> <td>Exercises</td> </tr> <tr> <td>Week 9</td> <td>Engines Hybrid Powertrains fort High Performance</td> <td>Transmissions</td> </tr> <tr> <td>Week 10</td> <td>Applications</td> <td>Repetition II</td> </tr> <tr> <td>Week 11</td> <td>final exam</td> <td></td> </tr> </tbody> </table>		Section 1	Section 2	Week 1	Hybrid Structures Energy and CO2-	Hybrid Structures Energy and CO2-	Week 2	equivalents	equivalents	Week 3	Homologation Electrical	Exercises	Week 4	Components	Analogy Analysis	Week 5	Operating Strategy	Repetition	Week 6	mid-term Operating		Week 7	Strategies II Thermal	Exercises	Week 8	Management Combustion	Exercises	Week 9	Engines Hybrid Powertrains fort High Performance	Transmissions	Week 10	Applications	Repetition II	Week 11	final exam	
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7	<p>Examination Forms and Prerequisites for Awarding ECTS Points</p> <p>Midterm and final exam written examination 90 min., graded The exam is an open book exam and the students can bring all documents (scripts and notes) and calculators.</p>																																				
8	<p>Estimated student workload: 40 hours</p>																																				
9	<p>Further Use of course Electrical Engineering, Mechatronics</p>																																				
10	<p>Course Manager and Full-Time Lecturer Prof. Dr. Franz Berndt</p>																																				
11	<p>Literature Lecture scripts with notes, exam samples with solution, instructor provides exercises.</p>																																				
12	<p>Course Registration Due to the limited number of participants, please register in advance by email at: kremena.daneva@hs-esslingen.de</p>																																				
13	<p>Last Updated 07.04.2026</p>																																				