

**Modul 1504 Modern Coating Systems**

1	<b>Module Number</b> 1502	<b>Study Programme</b> OMM (Master)	<b>Semester</b> 1/2	<b>Offered in</b> <input checked="" type="checkbox"/> WS <input type="checkbox"/> SS	<b>Duration</b> 1 Semester	<b>Module Type</b> choice	<b>Workload (h)</b> 180	<b>ECTS Points</b> 6
2	<b>Courses</b>		<b>Teaching and Learning Forms</b>		<b>Contact Time</b>		<b>Self-Study Time</b>	<b>Language</b>
					<b>(SWS)</b>	<b>(h)</b>	<b>(h)</b>	
	a)	Waterborne Coatings	Lecture		2	30	90	German/ Englisch
	b)	Powder Coating and Coil Coating	Lecture		2	30		
	c)	Radiation Curing	Lecture		2	30		
3	<p><b>Learning Outcomes and Competences</b> Once the module has been successfully completed, the students ...</p> <p><b>Knowledge and Understanding</b></p> <ul style="list-style-type: none"> <li>... understand and classify the ecological challenges of coating technology.</li> <li>... have knowledge of the composition, properties and applications of aqueous coating systems.</li> <li>... have profound knowledge in the field of powder coatings and coil coating.</li> <li>... knowledge of the raw material basis, the system technology of radiation curing.</li> <li>... understand the structure, formulation and behavior of radiation-curable systems.</li> <li>... use the basic knowledge described above to develop and apply own ideas.</li> <li>... represent the importance of the subject of modern coatings.</li> <li>... demonstrate a broad, detailed and critical understanding of the state of the art in aqueous coating systems, powder coatings and radiation curing.</li> <li>... balance the technical substance of issues in the field, taking into account scientific and methodological considerations.</li> </ul> <p><b>Use, Application and Generation of Knowledge</b></p> <p><i>Use and Transfer</i></p> <ul style="list-style-type: none"> <li>... describe requirement profiles in the application for low-emission paint systems.</li> <li>... evaluate aqueous coating systems as a solution for emission reduction compared to other low VOC coating systems.</li> <li>... profound knowledge of the coating processes of powder and coil coating</li> <li>... information about new developments in the powder coating and coil coating industry.</li> <li>... formulate radiation-curable systems.</li> <li>... elaborate requirements for the design of systems for radiation curing.</li> <li>... evaluate and compare water-based coatings, powder and coil coatings, radiation-curable coatings, solvent-based paints and other coatings.</li> <li>... ability to independently work on topic areas from the described paint areas.</li> <li>... independently acquire new knowledge and skills</li> </ul> <p><i>Scientific innovation</i></p> <ul style="list-style-type: none"> <li>... apply methods to develop modern coatings.</li> <li>... analyze and optimize the behavior of modern coating systems.</li> <li>... independently develop approaches for new concepts and assess their suitability.</li> <li>... develop concepts for the optimization of modern coatings.</li> </ul> <p><b>Communication und Cooperation</b></p> <ul style="list-style-type: none"> <li>... actively communicate within an organization and gain information.</li> <li>... interpret results and draw valid conclusions.</li> <li>... use the learned knowledge, skills and competences for problem analysis or new development and interpret it according to other criteria.</li> <li>... Explain and critically interpret research results</li> <li>... present and discuss professional contents.</li> <li>... communicate and cooperate in a group to find adequate solutions for the problems.</li> </ul> <p><b>Scientific Self-Conception/ Professionalism</b></p> <ul style="list-style-type: none"> <li>... deriving recommendations for decisions from a social and ethical perspective.</li> <li>... derive and develop solutions for the existing ecological challenges from the acquired knowledge and reflect alternatives</li> <li>... justify the developed solution theoretically and methodically.</li> <li>... develop a professional self-image that is oriented towards goals and standards of professional action</li> </ul>							

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4	<p><b>Contents</b></p> <p>a) Lecture Waterborne Coatings: Possibilities and limits of waterborne coatings to face environmental challenges. Physical principles (stabilization, film formation), of waterborne coatings. Aspects of application areas, that determine the type of coating concept (substrates, indoor-/outdoor, single or multi-layer paint bodies, spray, brush, roll or dip application). Material concepts: Ambient temperature drying and curing waterborne architectural, wood, plastic, composite and heavy duty corrosion protection coating systems based on acrylate, alkyd, 1K-polyurethane, 2K-Polyurethane, -2K-Epoxy systems. Electrodip coatings, 1K-enamels for automotive and industrial coatings.</p> <p>b) Lecture Powder Coating and Coil Coating Modern powder coating systems and new developments, advantages and disadvantages of powder coatings, important parameters in powder coating production, application and testing, new catalyzed powder coating systems, low temperature powder coatings for new materials like MDF boards, increased energy efficiency with new powder coatings. Discussion and evaluation of powder coating recipes. The coil coating process: chemical systems, application, advantages and disadvantages. Testing of coil coatings. New drying technologies. Comparison of powder and coil coating with other coating techniques.</p> <p>c) Lecture Radiation Curing Electron beam and UV technology, raw materials for radiation-curable systems (photoinitiators, reactive diluents, binders etc.), formulations of coating systems and adhesives (for example for films, wood furniture, printing inks, automotive, glass, electrical and electronic components) Application and curing technology (UV systems, ESH, protective gas technology, etc.) Analytical methods, mechanistic concepts of hardening, turnover, shrinkage, inner tensions Applications of radiation curing, advantages and disadvantages of the technology and comparison with alternative technologies</p>
5	<p><b>Participation Requirements</b></p> <p>Mandatory: solid basic knowledge in Chemistry, Physics and Coating Technology.</p>
6	<p><b>Examination Forms and Prerequisites for Awarding ECTS Points</b></p> <p>a) b) and c) written exam 90 min (graded)</p>
7	<p><b>Further Use of Module</b></p> <p>Elective module in Applied Surface and Material Sciences</p>
8	<p><b>Module Manager and Full-Time Lecturer</b></p> <p><b>Prof. Dr. Georg Meichsner</b>, Prof. Dr. Guido Wilke, Prof. Dr. Sandra Meinhard</p>

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9	<p><b>Literature</b></p> <p>a) Waterborne Coatings:</p> <ul style="list-style-type: none"><li>- Lecture script</li><li>- BASF Handbook Basics of Coating Technology, : 3rd edition, H.-J. Streitberger, A. Goldschmidt, Vincentz, Hannover, 2018</li><li>- Automotive Paints and Coatings, H.-J. Streitberger, K.-F. Dössel (Hrsg.), Wiley-VCH, Weinheim, Berlin, 2008.</li><li>- Coatings formulation, 3rd edition, Vincentz, Hannover, 2017</li></ul> <p>b) Powder Coating and Coil Coating</p> <ul style="list-style-type: none"><li>- Lecture script</li><li>- J. Pietschmann, Industrielle Pulverlackierung, Vieweg Verlag</li><li>- P. de Lange, Powder Coatings, Vincentz-Verlag</li><li>- B. Meuthen, A. Jandel, Coil Coating, Vieweg Verlag</li></ul> <p>d) Radiation Curing</p> <p>Lecture script</p> <p>R. Schwalm: UV-coatings, Basics, Recent Developments and new applications, Elsevier, Amsterdam 2007</p> <p>P. Glöckner et al.: Radiation Curing, Vincentz Verlag, 2009</p> <p>current publications of scientific literature</p>
10	<p><b>Last Updated</b> 28.07.2021</p>