



MODULHANDBUCH
Process Engineering (MPE)
(PE-M)

Stand: 20.04.2026

Studien- und Prüfungsordnung 2024/2

Modulhandbuch PE-M

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1. Semester

MPE-11: Chemical Conversion Processes

MPE-12: Biotechnological Conversion Processes

MPE-13: Advanced Process Engineering

MPE-14: Electives

MPE-15: Complementary subjects

MPE-15: Complementary subjects

MPE-11: Chemical Conversion Processes

Empfohlene Vorkenntnisse	Knowledge process engineering, fundamentals of thermo dynamics, understanding of reaction mechanism, basics in energy conversion, experience in active laboratory work	
Lehrform	Vorlesung/Labor	
Lernziele	By the end of the module, students(...) <ul style="list-style-type: none"> - have the knowledge and understanding for different thermochemical conversion processes - are able to calculate the fundamentals of these processes - have gained hands-on experience in exhaust gas analysis, calorific value measurements, pyrolysis, catalytic combustion, and the essential skill of balancing combustion processes, providing a solid foundation for understanding and manipulating combustion system. - know the philosophy of PtX with all the including main processes - have a deep understanding for the connection to renewable energy fundamentals, the importance of electrolysis, and the array of synthesis and conversion processes driving the transition towards a cleaner and more efficient energy future 	
Dauer	1 Semester	
SWS	6 SWS	
Aufwand	Lehrveranstaltung:	90,00 h
	Selbststudium/Gruppenarbeit:	120,00 h
	Workload:	210,00 h
ECTS	7,00 ECTS	
Voraussetzungen für die Vergabe von LP	Power to X and Thermochemical Conversion Process: written exam, 90 min.; weight: 100 % Lab Thermochemical Conversion Process: lab work	
Modulverantwortung	Professorin Dr. Sc. techn. Heide Biollaz	
Empfohlenes Semester	1. Semester	
Häufigkeit	jedes Jahr (WS)	
Verwendbarkeit	Master MPE	

LEHRVERANSTALTUNG: Thermochemical Conversion Process	
Art	Vorlesung
Nr.	M+V2528
SWS	2,00 SWS
Lerninhalt	The course is structured as follows: <ul style="list-style-type: none"> - fundamentals in fuel characterization for thermo chemical conversion processes - basic calculation of combustion processes - different thermo chemical processes like pyrolysis, gasification, combustion
Lehrveranstaltungs-sprache	de
Literatur	- Bridgwater, A.V.: Progress in thermochemical biomass conversion;

	Blackwell Sciences Ltd, Oxford, 2001 - Deublein, D., Steinhauser, A.: Biogas from Waste and Renewable Resources; Wiley-VCH, Weinheim, 2nd ed. 2010 - Schmidt, Achim: Technical Thermodynamics for Engineers: Basics and Applications, Springer, 2nd ed. 2022 - Energy from Organic Materials (Biomass): A Volume in the Encyclopedia of Sustainability Science and Technology, Springer, 2nd ed. 2019
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LEHRVERANSTALTUNG: Lab Thermochemical Conversion Process	
Art	Labor
Nr.	M+V2529
SWS	2,00 SWS
Lerninhalt	The course is structured as follows: - pyrolysis experiment - investigation of combustion process - calorific value measurements - characterization of organic materials (biomass) - gas analytic
Lehrveranstaltungs- sprache	de
Literatur	- Bridgwater, A.V.: Progress in thermochemical biomass conversion; Blackwell Sciences Ltd, Oxford, 2001 - Deublein, D.; Steinhauser, A.: Biogas from Waste and Renewable Resources; Wiley-VCH, Weinheim, 2nd ed. 2010 - Schmidt, Achim: Technical Thermodynamics for Engineers: Basics and Applications, Springer, 2nd ed. 2022 - Energy from Organic Materials (Biomass): A Volume in the Encyclopedia of Sustainability Science and Technology, Springer, 2nd ed. 2019

LEHRVERANSTALTUNG: Power to X	
Art	Vorlesung
Nr.	M+V2537
SWS	2,00 SWS
Lerninhalt	The course is structured as follows: - overview: PtX philosophy - basic processes and technologies in the PtX philosophy - renewable energy sources synthetic fuels
Lehrveranstaltungs- sprache	de
Literatur	- International Aspects of a Power-to-X Roadmap, frontier economics, 18th October 2018 - A.E.M. van den Oever, D. Costa, G. Cardellini, M. Messagie: Systematic review on the energy conversion efficiency of biomass-based Fischer-Tropsch plants, Fuel 324, 2022 - Markus Lehner, Robert Tichler, Horst Steinmüller, Markus Koppe,

	Power-to-Gas: Technology and Business Models, Springer, 2014
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MPE-12: Biotechnological Conversion Processes

Empfohlene Vorkenntnisse	General knowledge of basic conversion processes and techniques	
Lehrform	Vorlesung/Labor	
Lernziele	By the end of the module, students(...) <ul style="list-style-type: none"> - understand and apply the fundamental principles in the field of bioprocesses engineering - will have improved lab skills to transfer guidelines in an experimental setup - know the principles of basic Biotechnological Conversion processes to gain gaseous and liquid energy carriers - will be able to summarize complex scientific topics in a time limited oral presentation - will summarize own experimental results according to a guideline - will be able to setup an experimental device according to a given scientific problem 	
Dauer	1 Semester	
SWS	4 SWS	
Aufwand	Lehrveranstaltung:	60,00 h
	Selbststudium/Gruppenarbeit:	90,00 h
	Workload:	150,00 h
ECTS	5,00 ECTS	
Voraussetzungen für die Vergabe von LP	Biotechnological Conversion Processes: written exam, 60 minutes; weight 70 % Lab Biotechnological Conversion Processes: lab work; weight 30 %	
Modulverantwortung	Mr. Dr.-Ing. Andreas Wilke	
Empfohlenes Semester	1. Semester	
Häufigkeit	jedes Jahr (WS)	
Verwendbarkeit	Master MPE	

LEHRVERANSTALTUNG: Biotechnological Conversion Processes	
Art	Vorlesung
Nr.	M+V2504
SWS	2,00 SWS
Lerninhalt	The course is structured as follows: <ul style="list-style-type: none"> - Fundamentals in Bioprocess Engineering: Basic Bioreactors, Mode of Operation (Batch/Fedbatch/Continuous), Characterization of Bioreactors, Compartment Model - Biogas process: Engineering aspects, biological stages, economic and ecological aspects, current research topics - Biotechnological ethanol process:

	<p>Microbiological background, application, current research topics</p> <ul style="list-style-type: none"> - Biotechnological acetone/butanol process: <p>Microbiological background, application, current research topics</p> <ul style="list-style-type: none"> - Research in biotechnological conversion processes: <p>Microbial fuel cells, microalgae technology</p>
Lehrveranstaltungs- sprache	de
Literatur	<ul style="list-style-type: none"> - Gabriele Di Blasio, Avinash Kumar Agarwal, Giacomo Belgiorno, Pravesh Chandra Shukla: Clean Fuels for Mobility, E-Book, Springer, 2022 - Deublein, D.; Steinhauser, A.: Biogas from Waste and Renewable Resources, Wiley-VCH, Weinheim, 2. rev. and exp. Edition, 2011 - Blaschek, H.-P.; Ezeji, T.; Scheffran, J.: Biofuels from Agricultural Wastes and By-Products, Wiley Blackwell, 2010 - Vertes, A. (ed.); Qureshi, N.; Yukawa, H.; Blaschek, H.-P.: Biomass to Biofuels: Strategies for Global Industries, Wiley, 2010

LEHRVERANSTALTUNG: Lab Biotechnological Conversion Processes	
Art	Labor
Nr.	M+V2530
SWS	2,00 SWS
Lerninhalt	<p>The course is structured as follows:</p> <ul style="list-style-type: none"> - basic chemical laboratory safety rules. - pretreatment methods of organic substrate (enzymatic/mechanical) to increase the biogas kinetic and /or the biogas yield - setup and operation of the Biogas test device according to VDI 4630 - measurement of (organic) Dry Mass according to the DIN - measurement of the CO₂ and CH₄ concentration in the biogas <p>evaluation and presentation of the result</p>
Lehrveranstaltungs- sprache	de
Literatur	<ul style="list-style-type: none"> - Deublein, D.; Steinhauser, A.: Biogas from Waste and Renewable Resources An Introduction; 2. rev. and expanded edition, Wiley-VCH, Weinheim, October 2010 - VDI 4630: Fermentation of organic materials - Characterization of the substrate, sampling, collection of material data, fermentation tests; 132 pages; Herausgeber: VDI-Gesellschaft Energie- und Umwelt; 11.2016

MPE-13: Advanced Process Engineering

Empfohlene Vorkenntnisse	Good general knowledge in the various fields of process engineering, knowledge in mathematics (according to Engineering Bachelor's degree), chemistry, analytics and in single phase fluid mechanics.
Lehrform	Vorlesung/Labor
Lernziele	By the end of the module, students <ul style="list-style-type: none"> - are capable of identifying the process engineering key problems and questions, and of describing them to colleagues or to representatives of clients and ancillary companies. - broadened their knowledge and understanding of process engineering unit operations as well of special technologies such water processing. - understand the context of energy and raw material input, processes, production plants including process control equipment. - master practical skills to solve typical engineering problems in process engineering involving multiphase flows. - understand the fundamental principles of modelling and simulation, and the statistical experimental design. - can apply the concept to solve optimization tasks. - are able to present the results of the experimental work in a report which is structured as an international scientific paper.
Dauer	1 Semester
SWS	8 SWS
Aufwand	Lehrveranstaltung: 120,00 h
	Selbststudium/Gruppenarbeit: 120,00 h
	Workload: 240,00 h
ECTS	8,00 ECTS
Voraussetzungen für die Vergabe von LP	Modelling and Simulation and Water Processing + Lab: term paper; weight 50% Process Control Engineering and Multiphase Flows: written exam, 90 min.; weight 50%
Modulverantwortung	Professorin Dr.-Ing. Susanne Gleißle
Empfohlenes Semester	1. Semester
Häufigkeit	jedes Jahr (WS)
Verwendbarkeit	Master MPE

LEHRVERANSTALTUNG: Process Control Engineering	
Art	Vorlesung
Nr.	M+V2503
SWS	2,00 SWS
Lerninhalt	The course is structured as follows: <ul style="list-style-type: none"> - the automation pyramid - norms and regulations

	<ul style="list-style-type: none"> - the most relevant DCS systems - sensors and actuators - fieldbus systems - controller and DCS levels
Lehrveranstaltungs- sprache	de
Literatur	<ul style="list-style-type: none"> - Schildt, H.-H.; Kastner, W.: Prozeßautomatisierung; Springer, 1998 - Polke, M. (ed.): Process Control Engineering; VCH Weinheim 1994 - Siemens: Manual of Siemens Simatic PCS 7, part 1 and 2 Available online: <ul style="list-style-type: none"> - www.paccontrol.com/siemens-manuals/Process-Control-System-PCS-7-Part1.pdf - www.paccontrol.com/siemens-manuals/Process-Control-System-PCS-7-Part2.pdf

LEHRVERANSTALTUNG: Modelling and Simulation	
Art	Vorlesung
Nr.	M+V2531
SWS	2,00 SWS
Lerninhalt	The course is structured as follows: <ul style="list-style-type: none"> - Introduction to Berkeley Madonna as differential equation solver - Short repetition on Enzyme kinetics and Bioreactor processes - Formulation of mathematical models, e.g. for chemical reaction, enzyme kinetics or fermentation processes - Implementation of mathematical models in Berkeley Madonna, simulation and interpretation of simulation results - Definition of own modelling tasks, formulation of differential equation systems, implementation in Berkeley Madonna and description including source code - Introduction to statistical experimental design, empirical modelling of experimental results, interpretation of statistical indicators, utilization of models for optimization
Lehrveranstaltungs- sprache	de
Literatur	<ul style="list-style-type: none"> - Dunn, I.J., Heinzle, E., Ingham, J. Prenosil, J.E., Biological Reaction Engineering - Dynamic Modelling Fundamentals with Simulation, 2003 - Berkeley Madonna Guidelines (https://berkeley-madonna.myshopify.com/pages/download) - Shina, S., Industrial Design of Experiments, 2022 - Goos, P., Jones, B., Optimal Design of Experiments, 2011

LEHRVERANSTALTUNG: Water Processing + Lab	
Art	Vorlesung/Labor
Nr.	M+V2532
SWS	0,00 SWS
Lerninhalt	The course is structured as follows: <ul style="list-style-type: none"> - the current worldwide situation of the resource water - thermodynamic basics

	<ul style="list-style-type: none"> - transport phenomena for mass and heat - common technologies for seawater desalination - two drinking water production techniques: diffusion and thermal way - techniques of pervaporation and flash evaporation - in addition, experiments in the laboratory - a final presentation of the results
Lehrveranstaltungs-sprache	de
Literatur	<ul style="list-style-type: none"> - P. Stephan, K.Schaber, K. Stephan, F. Mayinger: Grundlagen und technische Anwendungen - Band 2, Mehrstoffsysteme, Springer Vieweg Verlag Berlin Heidelberg, 2017 - C. Judson King: Separation processes, second edition, Dover Publication Inc., 2013 - R. Byron Bird, Warren E. Stewart, Edwin N. Lightfoot: Transport Phenomena, Revised second edition, Wiley-VCH, 2006 - Peter Stephan, Stephan Kabelac, Matthias Kind, Dieter Mewes, Karlsheiz Schaber, Thomas Wetzel: VDI-Wärmeatlas, VDI-Gesellschaft Verfahrenstechnik und Chemieingenieurwesen, Springer Verlag Berlin Heidelberg, 2019

LEHRVERANSTALTUNG: Multiphase Flows	
Art	Vorlesung
Nr.	M+V2533
SWS	2,00 SWS
Lerninhalt	<p>The course is structured as follows:</p> <ul style="list-style-type: none"> - Introduction and characteristics of multiphase flows - Single particle motion - Bubble / droplet dynamics - Flow regimes - Cavitation - Modelling of multiphase flows, e.g., gas-liquid flows, gas-solid flows - Examples and applications
Lehrveranstaltungs-sprache	de
Literatur	<ul style="list-style-type: none"> - Brennen, C. E.: Fundamentals of Multiphase Flows. Cambridge University Press, 2005 - Clift, R; Grace, J. R.; Weber, M. E.: Bubbles, Drops and Particles. Courier Corporation, 2013 - Crowe C.T.; Michaelides, E.; Schwarzkopf, J.D.: Multiphase Flow Handbook. Taylor and Francis, 2016 - Michaelides, E. E.; Sommerfeld M.; van Wachem B.: Multiphase Flows with Droplets and Particles. CRC Press, 2022

MPE-14: Electives

Empfohlene Vorkenntnisse	none	
Lehrform	Vorlesung	
Lernziele	Students acquire skills in an area of their choice through elective modules from the elective modules/electives offered in the Master's program at the university.	
Dauer	1 Semester	
SWS	0 SWS	
Aufwand	Lehrveranstaltung:	0,00 h
	Selbststudium/Gruppenarbeit:	0,00 h
	Workload:	120,00 h
ECTS	4,00 ECTS	
Voraussetzungen für die Vergabe von LP	See list of elective modules	
Modulverantwortung	Professor Dr. rer. nat. Thomas Eisele	
Empfohlenes Semester	1. Semester	
Häufigkeit	jedes Jahr (WS)	
Verwendbarkeit	Master MPE	

MPE-15: Complementary subjects

Empfohlene Vorkenntnisse	Basic economics knowledge, business law fundamentals, project management principles, contract management basics, financial acumen, risk management concepts, stakeholder analysis, cultural awareness, communication theories, global business practices and cross-cultural communication skills	
Lehrform	Seminar	
Lernziele	<p>By the end of the module, students(...)</p> <ul style="list-style-type: none"> - understand and apply the fundamental principles of project management, including planning, execution, monitoring and closing projects. - will master project planning and scheduling techniques, utilizing tools such as Gantt charts and effective time management. - will be able to identify potential project risks, assess their impacts, and develop mitigation strategies. - have financial acumen and can ensure comprehensive financial control. - can engage key stakeholders and manage their expectations effectively through stakeholder management. - will have improved their leadership and team management skills through the study of conflict resolution, decision-making, and team building. - know the principles of quality assurance to ensure project deliverables meet the required standards. - will be able to confidently manage complex projects and ensure that they are completed successful, on-time, and within-budget delivery while meeting quality standards. - Cultural Dimensions: Understand and explain cultural dimensions like perception, values, and hierarchy. - Hierarchy Impact: Analyze the impact of hierarchy on organizations and communication. - Conflict Resolution: Develop and apply conflict resolution strategies. - Feedback Skills: Practice giving and receiving feedback in intercultural contexts. - Time Management: Implement planning and time management techniques across cultures. - Listening Comprehension: Improve understanding of spoken language in various contexts. - Speaking Fluency: Enhance fluency and confidence in verbal communication. - Reading Proficiency: Develop the ability to comprehend and analyze written texts. - Writing Skills: Strengthen writing skills for different purposes and audiences. - Grammar and Vocabulary: Expand knowledge of grammar rules and vocabulary usage. 	
Dauer	1 Semester	
SWS	6 SWS	
Aufwand	Lehrveranstaltung:	90,00 h
	Selbststudium/Gruppenarbeit:	90,00 h

	Workload: 180,00 h
ECTS	6,00 ECTS
Voraussetzungen für die Vergabe von LP	Project Management - Commercial Framework: oral presentation; weight 50% Intercultural Competences: oral presentation; must be passed successfully; weight: - Language skills: exam according to the Language Center; weight 50%
Modulverantwortung	Professor Dr. rer. nat. Thomas Eisele
Empfohlenes Semester	1. Semester
Häufigkeit	jedes Jahr (WS)
Verwendbarkeit	Master MPE

LEHRVERANSTALTUNG: Intercultural Competences	
Art	Seminar
Nr.	M+V2528
SWS	2,00 SWS
Lerninhalt	The course is structured as follows: - Culture: relevance, differences in and sharing culture, seeing vs understanding other cultures - Values, filters and perspectives, concept of time, code of respect and contact, self-presentation, addressing people - Communication training
Lehrveranstaltungs-sprache	de
Literatur	- Meyer, Erin: The Culture Map: Decoding How People Think, Lead, and Get Things Done Across Cultures; Public Affairs, multiple editions - Hofstede, Gert: Cultures and Organizations - Software of the Mind; multiple editions - Hofstede, Gert.: Culture's Consequences: Comparing Values, Behaviors, Institutions and Organizations Across Nations, Thousand Oaks CA: Sage Publication - Zein, Omar: Culture and Project Management; Gower Publishing Company - Hall, Edward T.: The Silent Language; Random House Anchor Books - Hall, Edward T.: The Hidden Dimension; Anchor Books Doubleday - Kramer, Jitske: Managing Cultural Dynamics; Human Dimension Publication Utrecht - Business case studies

LEHRVERANSTALTUNG: Project Management - Commercial Framework	
Art	Seminar
Nr.	M+V2534
SWS	2,00 SWS
Lerninhalt	The course is structured as follows: - project management (planning, execution, monitoring and closing)

	projects) - project planning (Gantt charts and effective time management) - risk management - financial control - stakeholder management
Lehrveranstaltungs- sprache	de
Literatur	- Lean Six Sigma; Methods for Production Optimization, Springer 2024 - Six Sigma - kompakt und praxisnah, Springer 2019

MPE-15: Complementary subjects

Empfohlene Vorkenntnisse	
Lehrform	Seminar
Lernziele	
Dauer	1 Semester
SWS	6 SWS
Aufwand	Lehrveranstaltung: 90,00 h
	Selbststudium/Gruppenarbeit: 90,00 h
	Workload: 180,00 h
ECTS	6,00 ECTS
Voraussetzungen für die Vergabe von LP	
Modulverantwortung	
Empfohlenes Semester	1. Semester
Häufigkeit	jedes Jahr (WS)
Verwendbarkeit	

2. Semester

MPE-21: Geoengineering

MPE-22: Food

MPE-21: Geoengineering

Empfohlene Vorkenntnisse	Bachelor's level knowledge in environmental sciences and biotechnology.	
Lehrform	Vorlesung/Labor/Seminar/P	
Lernziele	See information at UWM.	
Dauer	1 Semester	
SWS	0 SWS	
Aufwand	Lehrveranstaltung:	0,00 h
	Selbststudium/Gruppenarbeit:	0,00 h
	Workload:	900,00 h
ECTS	30,00 ECTS	
Voraussetzungen für die Vergabe von LP	See information at UWM.	
Modulverantwortung	Prof. Irena Wojnowska-Baryla (Ms), UWM	
Empfohlenes Semester	2. Semester	
Häufigkeit	jedes Jahr (SS)	
Verwendbarkeit	Master MPE	

MPE-22: Food

Empfohlene Vorkenntnisse	Bachelor's level knowledge in process engineering and biotechnology.	
Lehrform	Vorlesung/Labor/Seminar/P	
Lernziele	See information at UWM.	
Dauer	1 Semester	
SWS	0 SWS	
Aufwand	Lehrveranstaltung:	0,00 h
	Selbststudium/Gruppenarbeit:	0,00 h
	Workload:	900,00 h
ECTS	30,00 ECTS	
Voraussetzungen für die Vergabe von LP	See information at UWM.	
Modulverantwortung	Dr inz. Aleksander Kubiak (Mr), UWM	
Empfohlenes Semester	2. Semester	
Häufigkeit	jedes Jahr (SS)	
Verwendbarkeit	Master MPE	

3. Semester

MPE-31: Master's Thesis

MPE-31: Master's Thesis

Empfohlene Vorkenntnisse	General knowledge in Process engineering and Scientific Writing.	
Lehrform	Wissenschaftl. Arbeit/Sem	
Lernziele	The master thesis allows the student to demonstrate his or her ability to independently handle a scientific project from the area of process engineering within a limited period of time by means of scientific methods. This includes gathering information from scientific sources, conducting experimental work, critically scrutinising methods and results, writing a scientific thesis, and presenting the work to an audience.	
Dauer	1 Semester	
SWS	0 SWS	
Aufwand	Lehrveranstaltung:	0,00 h
	Selbststudium/Gruppenarbeit:	900,00 h
	Workload:	900,00 h
ECTS	30,00 ECTS	
Voraussetzungen für die Vergabe von LP	The thesis is defended by the student with an oral presentation of about 15 minutes and a discussion of about 10 minutes. The discussion constitutes a final oral examination.	
Modulverantwortung	Professor Dr. rer. nat. Thomas Eisele	
Empfohlenes Semester	3. Semester	
Häufigkeit	jedes Semester	
Verwendbarkeit	Master MPE	

LEHRVERANSTALTUNG: Master's Thesis	
Art	Wissenschaftl. Arbeit
Nr.	M+V2535
SWS	0,00 SWS
Lerninhalt	The students develop the chosen topic following as a scientific project and document their approach and results in a thesis report.
Lehrveranstaltungs-sprache	de
Literatur	Depending on the topic of the master thesis.

LEHRVERANSTALTUNG: Presentation an Defense	
Art	Seminar
Nr.	M+V2536
SWS	0,00 SWS
Lerninhalt	The students present the outcomes of their thesis in an oral presentation.
Lehrveranstaltungs-sprache	de

Literatur	Depending on the topic of the master thesis.
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