HOCHSCHULE HEILBRONN

Modulhandbuch

Fakultät Technik und Wirtschaft
Studiengang International Master of Technical Innovation
mit Abschluss Master of Science (M.Sc.)

Datum der Einführung:	**01.09.2025 (geplant)**
Studiengangverantwortlicher:	**Prof. Dr. Martin Wäldele**
Erstellungsdatum:	**25.10.2024**
Workload:	**25h/ECTS**
SPO:	1

HOCHSCHULE HEILBRONN

Überblick über die Module des Studiengangs

Modul	Verantwortlich
M1 Global Development Management	Prof. Dr.-Ing. Martin Wäldele
M2 Sustainable Product Development	Prof. Dr.-Ing. Martin Wäldele
M3 Advanced Automation	Prof. Dr.-Ing. Ralf Gessler
M4 Intelligent Data Systems	Prof. Dr. Ingmar Groh
M5 Strategic Technologies 1	Prof. Dr.-Ing. Ralf Gessler
M6 Strategic Technologies 2	Prof. Dr.-Ing. Martin Wäldele
M7 Portfolio Optimization 1	Prof. Dr.-Ing. Marcus Stolz
M8 Portfolio Optimization 2	Prof. Dr.-Ing. Marcus Stolz
M9 Applied Research Studies	Prof. Dr.-Ing. Marcus Stolz
M10 Applied Development Studies	Prof. Dr.-Ing. Marcus Stolz
M11 Master Thesis	Prof. Dr.-Ing. Martin Wäldele

Ziele des Studiengangs International Master of Technical Innovation

The goals of an Innovation Management degree program focus on equipping students with the skills and knowledge needed to lead and manage innovation in organizations. The program aims to develop strategic thinkers capable of identifying opportunities for innovation, searching for creative solutions, and implementing them effectively. One of the primary objectives is to help students understand the dynamics of innovation and its role in driving competitive advantage and business growth. This includes an in-depth exploration of new methods and strategic technologies, that influence innovation processes across industries.
Practical experience is a key component, so real-world projects ensure that the students can apply advanced technologies and methods in professional contexts.

The program's duration of study is three semesters. Two of these semesters are spent studying at the university, the third semester is used to write the Master's thesis, typically at a cooperating industrial company.

The course content is designed to equip students with advanced skills in innovation management, technology development, and entrepreneurial thinking:

- Manage and drive innovation within organizations
- Explore strategic technologies, e. g. artificial intelligence and automation
- Develop key capabilities for R&D, e. g. leadership, technical and intercultural management
- Realize projects in cooperation with our regional industrial partners
- Prepare for a successful career in local and international tech-based companies

Überblick über die Lehrveranstaltungen des Studiengangs

The table is shown as an example for students starting their studies in the winter semester. In case of a start in the summer semester, the first and second semesters are swapped.

Sem.	Lehrveranstaltung					Prüfungsleistung		ECTS
	EDV-Nr.	Modul-Nr.	Bezeichnung	Art	Umfang in SWS	Art	Dauer in Min.	
1	293 550	M1	Sustainable Product Development		4	PK	90	5
	293 551	M1.1	Innovation Management		2			
	293 552	M1.2	Sustainability and Ethics		2			
	293 570	M3	Advanced Automation		4	PK	90	5
	293 571	M3.1	Embedded and Edge Systems		2			
	293 572	M3.2	Industrial Software Engineering		2			
	293 590	M5	Strategic Technologies 1		4	PK	90	5
	293591	M5.1	Development of Power Electronics		2			(2,5)
	293592	M5.2	Electric, Magnetic and Mechanic Energy Converters		2			(2,5)
	293 610	M7	Portfolio Optimization 1		4			5
	293611	M7.1	German as a Foreign Language 1		4	LKBK	90	(5)
	293612	M7.2	Advised Studies		4	LKBK	90	(5)
	293 630	M9	Applied Research Studies		8			10
	293 631	M9.1	Entrepreneurship in R&D		2	LR	20	2,5
	293 632	M9.2	Research Project		6	LL		7,5
Summe	Sem. 1				24			**30**
2	293 560	M2	Global Development Management		4	PK	90	5
	293 561	M2.1	Product and Engineering Design		2			
	293 562	M2.2	Intercultural Communication		2			
	293 580	M4	Intelligent Data Systems		4	PK	90	5
	293 581	M4.1	AI in Technical Systems		2			
	293 582	M4.2	Industrial Data Analytics		2			
	293 600	M6	Strategic Technologies 2		4	PK	90	5
	293601	M6.1	Computer Vision		2			(2,5)
	293602	M6.2	Assembly and Handling Systems		2			(2,5)
	293 620	M8	Portfolio Optimization 2		4			5
	293621	M8.1	German as a Foreign Language 2		4	LKBK	90	(5)
	293622	M8.2	Advised Studies		4	LKBK	90	(5)
	293 640	M10	Applied Development Studies		8			10
	293 641	M10.1	Leadership in R&D		2	LR	20	2,5
	293 642	M10.2	Development Project		6	LL		7,5
Summe	Sem. 2				24			**30**
3	293 650	M11	Master Thesis					
	293 651	M11.1	Master Thesis			PT		28
	293 652	M11.2	Master Thesis Colloquium			LM	30	2
Summe	Sem. 3							**30**
Summe	Master							**90**

Modul M1 293550 Sustainable Product Development

Dauer des Moduls	1 Semester
SWS	4.0
Prüfungsart	Lehrveranstaltungsübergreifend durch Klausur
Prüfungsdauer	90 Minuten
Leistungspunkte (ECTS)	5.0
Voraussetzungen für die Vergabe von Leistungspunkten	
Modulverantwortliche(r)	Prof. Dr.-Ing. Martin Wäldele
Lehr-, Lern- und Prüfungsformen	Lehrveranstaltungsübergreifend durch Klausur; 90 Min.
Lerninhalte	The module „Sustainable Product Development" provides a holistic approach to prepare future engineers to navigate the complexities of modern engineering challenges effectively. On the one hand it focuses on the processes and practices that foster creativity and the development of new technologies. Students learn about ideation techniques, project management, and strategies for successfully implementing innovative solutions within organizations. Emphasis is placed on understanding market needs, leveraging technology trends, and managing the innovation lifecycle from conception to commercialization. On the other hand, the critical importance of ethical considerations and sustainable practices in engineering is addressed. This part of the module equips students with the knowledge to evaluate the environmental, social, and economic impacts of engineering projects. Students explore frameworks for ethical decision-making, corporate social responsibility, and the role of engineers in promoting sustainable development.
Fachkompetenz: Wissen und Verstehen (Lernziele)	• This course aims to introduce the fundamental principles of innovation. Participants will gain insights into the key drivers of innovation and the significance of business model analysis and generation. Additionally, the course will cover the foundations of human-centered innovation and the importance of understanding market needs. • Moreover, it will explore intellectual property (IP) management and strategies, highlighting their role in fostering an innovation culture within organizations. • The students • are familiar with the basics of environmental pollution and circular systems. • will be able to assess the interrelationships between environmental impacts, environmental pollution and the impact of mankind.

	• know the principles of sustainability combined with the basics of environmental economics and environmental management. • are familiar with ethical values in the area of sustainability.
Fachkompetenz: Fertigkeit, Wissenserschließung	The students are able to • apply and reflect on the environmental impacts of the relevant sectors. • evaluate complex environmental impacts in monetary terms and reflect on their effects. • analyze and structure chemical and physical environmental impacts and combine them in an environmental management system. • apply, analyze and compare comprehensive life cycle assessments using LCA tools like SimaPro. • to read and to know the limit of published life cycle assessments in the context of various stakeholders.
Personale Kompetenz: Sozialkompetenz	The students • work in a team-oriented manner and achieve good results in the group. • can present and represent the results of the group's work and lead interdisciplinary discussions. • work in groups to solve challenging tasks in the areas of environmental impact, environmental economics and environmental management. • complete life cycle assessments as self-study units and support each other • discuss environmental issues related to economics and sustainability openly and critically.
Personale Kompetenz: Selbständigkeit	The students • deepen the questions of the lecture independently. • organize their own work processes effectively. • are characterized by the ability to work on a task with perseverance.
Kompetenzniveau gemäß DQR	7
Voraussetzungen für die Teilnahme	
Besonderheiten / Verwendbarkeit	
Terminierung im Stundenplan	https://splan.hs-heilbronn.de/splan/
Leistungsnachweis bei kombinierter Prüfung	

Veranstaltung M1.1 293551 Innovation Management

Diese Veranstaltung ist Pflichtveranstaltung im Modul M1

Lehrveranstaltungsverantwortliche(r)	Prof. Dr.-Ing. Martin Wäldele
Semester	1
Häufigkeit des Angebots	Wintersemester
Art der Veranstaltung	Vorlesung mit Übungen
Lehrsprache	Englisch
Leistungspunkte (ECTS)	2.5
SWS	2.0, dies entspricht einem Workload von 62.5 Stunden
Workload - Kontaktstunden	30
Workload - Selbststudium	32.5
Detailbemerkung zum Workload	
Prüfungsart	Lehrveranstaltung ohne Prüfung, hier: Prüfung auf Modulebene
Prüfungsdauer	
Verpflichtung	Pflichtmodul
Voraussetzungen für die Teilnahme	
Lehr-/Lernmethoden (Lehrformen)	Lecture with exercise Self-study • Follow-up of the lecture • Exercises • Literature study Accompanying exam preparation
Fachkompetenz: Wissen und Verstehen	This course aims to introduce the fundamental principles of innovation. Participants will gain insights into the key drivers of innovation and the significance of business model analysis and generation. Additionally, the course will cover the foundations of human-centered innovation and the importance of understanding market needs. Moreover, it will explore intellectual property (IP) management and strategies, highlighting their role in fostering an innovation culture within organizations.

Fachkompetenz: Fertigkeit und Wissenserschließung	The students are able to • understand the fundamentals of innovation: Grasp the basic principles and concepts of innovation, enabling them to apply these ideas in various contexts. • identify key drivers of innovation: Recognize and analyze the primary factors that drive innovation within industries and organizations. • conduct business model analysis: Evaluate and generate effective business models, understanding their critical role in facilitating innovation and growth. • implement human-centered Innovation: Apply principles of human-centered design to create solutions that meet real market needs and enhance user experience. • assess market needs: Conduct market research to identify customer requirements and trends, ensuring that innovations align with market demands. • manage intellectual property: Develop strategies for IP management, understanding its importance in protecting innovations and maintaining competitive advantage. • foster an innovation culture: Cultivate a culture of innovation within organizations, using strategies that encourage creativity, collaboration, and risk-taking.
Personale Kompetenz: Sozialkompetenz	The students • work in a team-oriented manner and achieve good results in the group. • can present and represent the results of the group's work and lead interdisciplinary discussions.
Personale Kompetenz: Selbständigkeit	The students • deepen the questions of the lecture independently. • organize their own work processes effectively. • are characterized by the ability to work on a task with perseverance.
Kompetenzniveau gemäß DQR	7
Inhalte	• Fundamentals of innovation: Understanding the definitions, types, and drivers of innovation, including technological, product, process and business model innovation. • Technology and market assessment: Tools for analyzing market needs, evaluating technological feasibility, and assessing the potential value and impact of innovations. • Intellectual property and patenting: Basics of intellectual property rights, patent processes, and strategies to protect engineering innovations. • Innovation culture and leadership: How to build a culture of innovation within engineering teams, including leadership skills, team dynamics, and strategies to encourage risk-taking and creativity.

Empfehlung für begleitende Veranstaltungen	
Sonstige Besonderheiten	
Literatur/Lernquellen	• Eversheim, Walter: Innovation Management for Technical Products: Systematic and Integrated Product Development and Production Planning. Berlin Heidelberg: Springer Science & Business Media, 2008. • Gassmann, Oliver; Bader, Martin A.; Thompson, Mark James: Patent Management: Protecting Intellectual Property and Innovation. Cham, Heidelberg, New York, Dordrecht, London: Springer International Publishing, 2020. • Osterwalder, A. ; Pigneur, Y. ; Bernarda, G. ; Smith, A.: Value Proposition Design : How to Create Products and Services Customers Want. New York: John Wiley & Sons, 2015. • Aagaard, Annabeth: Business Model Innovation: Game Changers and Contemporary Issues. Singapore: Springer Nature, 2024. • Gassmann, Oliver; Frankenberger, Karolin; Choudury, Michaela; Csik, Michaela: The Business Model Navigator: The Strategies Behind The Most Successful Companies. London: Pearson UK, 2020.
Terminierung im Stundenplan	https://splan.hs-heilbronn.de/splan/
Leistungsnachweis bei kombinierter Prüfung	

Veranstaltung M1.2 293552 Sustainability and Ethics

Diese Veranstaltung ist Pflichtveranstaltung im Modul M1

Lehrveranstaltungsverantwortliche(r)	Prof. Dr.-Ing. Anke Ostertag
Semester	1
Häufigkeit des Angebots	Wintersemester
Art der Veranstaltung	Vorlesung mit Übungen
Lehrsprache	Englisch
Leistungspunkte (ECTS)	2.5
SWS	2.0, dies entspricht einem Workload von 62.5 Stunden
Workload - Kontaktstunden	30
Workload - Selbststudium	32.5
Detailbemerkung zum Workload	
Prüfungsart	Lehrveranstaltung ohne Prüfung, hier: Prüfung auf Modulebene
Prüfungsdauer	
Verpflichtung	Pflichtmodul
Voraussetzungen für die Teilnahme	
Lehr-/Lernmethoden (Lehrformen)	Lecture with exercise Self-study • Follow-up of the lecture • Exercises • Literature study Accompanying exam preparation
Fachkompetenz: Wissen und Verstehen	The students • are familiar with the basics of environmental pollution and circular systems. • will be able to assess the interrelationships between environmental impacts, environmental pollution and the impact of mankind. • know the principles of sustainability combined with the basics of environmental economics and environmental management. • are familiar with ethical values in the area of sustainability.

Fachkompetenz: Fertigkeit und Wissenserschließung	The students are able to • apply and reflect on the environmental impacts of the relevant sectors. • evaluate complex environmental impacts in monetary terms and reflect on their effects. • analyze and structure chemical and physical environmental impacts and combine them in an environmental management system. • apply, analyze and compare comprehensive life cycle assessments using LCA tools like SimaPro. • to read and to know the limit of published life cycle assessments in the context of various stakeholders.
Personale Kompetenz: Sozialkompetenz	The students • work in groups to solve challenging tasks in the areas of environmental impact, environmental economics and environmental management. • complete life cycle assessments as self-study units and support each other. • discuss environmental issues related to economics and sustainability openly and critically.
Personale Kompetenz: Selbständigkeit	The students • reflect on and evaluate their own learning and work objectives and pursue them in a self-directed manner. • see the consequences for the work processes in their learning teams and implement them efficiently accordingly. • correctly assess their own abilities and are able to acquire advanced content.
Kompetenzniveau gemäß DQR	7
Inhalte	• Basics and theory of environmental economics and environmental management - Basics - Sustainability - Ethics - Environmental economics - Environmental management • Application: Life Cycle Assessment - Basics • Application of LCA Tool like SimaPro
Empfehlung für begleitende Veranstaltungen	
Sonstige Besonderheiten	
Literatur/Lernquellen	• Sambargi S., Shuba N.S.: Nudging Green: Behavioral Economics and Environmental Sustainability, Springer, 1 edition, 2024 • Srivastava R.; Singh S.: Environmental Risk over Indian Subcontinents: Consequenceces and Impacts, Springer, 1 editin, 2024 • Oblakovic G., Dogan I.D., Lajtman M.K.: Life-Cycle Analysis, Springer, 1 edition, 2023

Terminierung im Stundenplan	https://splan.hs-heilbronn.de/splan/
Leistungsnachweis bei kombinierter Prüfung	

Modul M2 293560 Global Development Management

Dauer des Moduls	1 Semester
SWS	4.0
Prüfungsart	Lehrveranstaltungsübergreifend durch Klausur
	90 Minuten
Leistungspunkte (ECTS)	5.0
Voraussetzungen für die Vergabe von Leistungspunkten	
Modulverantwortliche(r)	Prof. Dr.-Ing. Martin Wäldele
Lehr-, Lern- und Prüfungsformen	Lehrveranstaltungsübergreifend durch Klausur; 90 Min.
Lerninhalte	The module "Global Development Management" aims to equip students with essential skills for designing innovative products while effectively navigating diverse cultural contexts. The students learn about the principles of design thinking and the engineering design process, include user-centered design, requirements analysis, prototyping, and testing. The goal it to create innovative and functional products by applying various design methodologies, emphasizing creativity and sustainability while considering the technical, aesthetic, and ergonomic aspects of product development. Additionally, the students gain insights into the challenges of managing projects in diverse cultural and political environments, learning how to adapt strategies to local contexts. Studies of successful and unsuccessful projects provide practical insights, fostering critical thinking and problem-solving skills.
Fachkompetenz: Wissen und Verstehen (Lernziele)	The focus of this course is on gaining an advanced understanding of the concepts associated with culture and communication. The course provides students the opportunity to develop intercultural awareness, perception and thinking patterns to enable effective communication across cultural boundaries. The students • know the various methods and procedures for product development. • have in-depth knowledge of project management for national and international projects. • are familiar with the implementation of a continuous development process in companies and formulate the framework conditions for international cooperation.
Fachkompetenz: Fertigkeit, Wissenserschließung	The students are able to

	• systematically apply methods in product development, covering stages like problem definition, concept generation, and refinement. • explore the entire product development process, from initial concepts to final implementation, ensuring alignment with market needs. • focus on developing innovative concepts that meet defined requirements and utilize Quality Function Deployment (QFD) to analyze and prioritize customer needs. • gain proficiency in various product development tools, including value analysis, target costing, and FMEA. • to consider global market conditions and constraints when developing product concepts. • learn to analyze communicative situations from everyday life and work with the help of communication models. • to recognize and understand the cultural aspects contained therein and design intercultural communication processes. • To describe cultural differences and determine their significance for cooperation in intercultural teams. • solve problems in intercultural teams with the help of the knowledge they have acquired.
Personale Kompetenz: Sozialkompetenz	The students • work together with other people such as employees and colleagues in a goal-orientated manner. • achieve work results by exchanging knowledge and documenting them. • assume responsibility in a team. • should be able to recognize and, if possible, avoid mistakes when dealing with other cultures.
Personale Kompetenz: Selbständigkeit	The students • regularly discuss the actual and target comparisons in the progress of the project. • can transfer the examples from the lecture to real tasks in system development. • can familiarize themselves independently with specifications. • know the scope and effects of individual system requirements. • repeat and deepen the material independently with the secondary literature specified in the script. • independently assess their level of learning by answering the questions provided in the script at the end of the learning units.
Kompetenzniveau gemäß DQR	7
Voraussetzungen für die Teilnahme	
Besonderheiten / Verwendbarkeit	
Terminierung im Stundenplan	https://splan.hs-heilbronn.de/splan/
Leistungsnachweis bei kombinierter Prüfung	

HOCHSCHULE HEILBRONN

Veranstaltung M2.1 293561 Product and Engineering Design

Diese Veranstaltung ist Pflichtveranstaltung im Modul M2

Lehrveranstaltungsverantwortliche(r)	Prof. Dr.-Ing. Martin Wäldele
Semester	2
Häufigkeit des Angebots	Sommersemester
Art der Veranstaltung	Vorlesung mit Übungen
Lehrsprache	Englisch
Leistungspunkte (ECTS)	2.5
SWS	2.0, dies entspricht einem Workload von 62.5 Stunden
Workload - Kontaktstunden	30
Workload - Selbststudium	32.5
Detailbemerkung zum Workload	
Prüfungsart	Lehrveranstaltung ohne Prüfung, hier: Prüfung auf Modulebene
Prüfungsdauer	
Verpflichtung	Pflichtmodul
Voraussetzungen für die Teilnahme	
Lehr-/Lernmethoden (Lehrformen)	Lecture with exercise Self-study • Follow-up of the lecture • Exercises • Literature study Accompanying exam preparation
Fachkompetenz: Wissen und Verstehen	The students • know the various methods and procedures for product development. • are familiar with the implementation of a continuous development process in companies and formulate the framework conditions for international cooperation. • have in-depth knowledge of project management for national and international projects.

Fachkompetenz: Fertigkeit und Wissenserschließung	The students are able to • systematically apply methods in product development, covering stages like problem definition, concept generation, and refinement. • explore the entire product development process, from initial concepts to final implementation, ensuring alignment with market needs. • focus on developing innovative concepts that meet defined requirements and utilize Quality Function Deployment (QFD) to analyze and prioritize customer needs. • gain proficiency in various product development tools, including value analysis, target costing, and FMEA. • to consider global market conditions and constraints when developing product concepts.

Personale Kompetenz: Sozialkompetenz	The students • work together with other people such as employees and colleagues in a goal-orientated manner. • achieve work results by exchanging knowledge and documenting them. • assume responsibility in a team.
Personale Kompetenz: Selbständigkeit	The students • regularly discuss the actual and target comparisons in the progress of the project. • can transfer the examples from the lecture to real tasks in system development. • can familiarize themselves independently with specifications. • know the scope and effects of individual system requirements.
Kompetenzniveau gemäß DQR	7
Inhalte	• Systematic design process: systematic methodologies in product development, covering stages such as problem definition, concept generation, and refinement. • Comprehensive product development: development process, from initial concepts to final implementation, ensuring alignment with market needs. • Concept development: techniques for developing innovative product concepts that meet defined requirements and customer expectations. • Quality function deployment (QFD): prioritize customer needs, translating them into specific design requirements for successful product outcomes. • Product development tools: value analysis, target costing, Total Quality Management (TQM), FMEA, Technology Readiness Level (TRL) • Global context in product development: Develop product concepts considering global market conditions and framework constraints, applying the methodologies discussed in class.

Empfehlung für begleitende Veranstaltungen	
Sonstige Besonderheiten	
Literatur/Lernquellen	• Andreasen, M.; Hansen, C.; Cash, P.: Conceptual Design: Interpretations, Mindset and Models. Berlin, Heidelberg: Springer, 2015. • Ponn, Josef; Hutterer, Philipp; Braun, Thomas; Birkhofer, Herbert; Ehrlenspiel, Klaus: Methoden der integrierten Produktentwicklung: Leitfaden für die Praxis. München: Hanser Fachbuchverlag, 2024. • Beate B., Kilian G.: Pahl/Beitz Konstruktionslehre: Methoden und Anwendung erfolgreicher Produktentwicklung, Berlin: Springer Vieweg, 2021. • Ehrlenspiel, K., Kiewert, A.: Integrated Product Development (2nd ed.). Springer, 2007.
Terminierung im Stundenplan	https://splan.hs-heilbronn.de/splan/
Leistungsnachweis bei kombinierter Prüfung	

HOCHSCHULE HEILBRONN

Veranstaltung M2.2 293562 Intercultural Communication

Diese Veranstaltung ist Pflichtveranstaltung im Modul M2

Lehrveranstaltungsverantwortliche(r)	Prof. Dr. Simona Gentile-Lüdecke
Semester	2
Häufigkeit des Angebots	Sommersemester
Art der Veranstaltung	Seminar
Lehrsprache	Englisch
Leistungspunkte (ECTS)	2.5
SWS	2.0, dies entspricht einem Workload von 62.5 Stunden
Workload - Kontaktstunden	30
Workload - Selbststudium	32.5
Detailbemerkung zum Workload	
Prüfungsart	Lehrveranstaltung ohne Prüfung, hier: Prüfung auf Modulebene
Prüfungsdauer	
Verpflichtung	Pflichtmodul
Voraussetzungen für die Teilnahme	
Lehr-/Lernmethoden (Lehrformen)	• Vorlesung mit Übungen • Gruppenarbeiten • Rollenspiele • Fallstudien
Fachkompetenz: Wissen und Verstehen	The focus of this course is on gaining an advanced understanding of the concepts associated with culture and communication. The course provides students the opportunity to develop intercultural awareness, perception and thinking patterns to enable effective communication across cultural boundaries.

Fachkompetenz: Fertigkeit und Wissenserschließung	The students learn to analyse communicative situations from everyday life and work with the help of communication models. They will be able to recognise and understand the cultural aspects contained therein and design intercultural communication processes. The students should be able to describe cultural differences and determine their significance for cooperation in intercultural teams. Students should be able to solve problems in intercultural teams with the help of the knowledge they have acquired.
Personale Kompetenz: Sozialkompetenz	The students • should be able to recognise and, if possible, avoid mistakes when dealing with other cultures.
Personale Kompetenz: Selbständigkeit	The students • repeat and deepen the material independently with the secondary literature specified in the script. • independently assess their level of learning by answering the questions provided in the script at the end of the learning units.
Kompetenzniveau gemäß DQR	7
Inhalte	• The need for intercultural communication • The cultural context • The dimensions of culture • The verbal and non-verbal code • Theories of intercultural communication • Intercultural communication in intercultural conflicts • Intercultural communication in intercultural business negotiations • Intercultural communication in the management and leadership of multicultural (virtual) teams
Empfehlung für begleitende Veranstaltungen	
Sonstige Besonderheiten	
Literatur/Lernquellen	• Neuliep, J. W. (2006). Intercultural communication: A contextual approach, Thousand Oaks, Calif: Sage Publications • House, R.J. et al. (2014) Culture, leadership, and organizations- The Globe Study of 62 Societies, Thousand Oaks, Calif: Sage Publications • Lewis, R.D. (2012) When cultures collide. Leading across cultures, Boston-London: Nicholas Brealey International • Hofstede, G., Hostede, G. J. and Minkov, M. (2010) Cultures and organizations: Software of the Mind, 3rd ed., New York: MacGraw Hill • Gudykunst, W. B., Kim, Y. Y. (1997). Communicating with Strangers: an approach to intercultural communication, 3. ed., Boston: McGraw-Hill.

Terminierung im Stundenplan	https://splan.hs-heilbronn.de/splan/
Leistungsnachweis bei kombinierter Prüfung	

HOCHSCHULE HEILBRONN

Modul M3 293570 Advanced Automation

Dauer des Moduls	1 Semester
SWS	4.0
Prüfungsart	Lehrveranstaltungsübergreifend durch Klausur
Prüfungsdauer	90 Minuten
Leistungspunkte (ECTS)	5.0
Voraussetzungen für die Vergabe von Leistungspunkten	
Modulverantwortliche(r)	Prof. Dr.-Ing. Ralf Gessler
Lehr-, Lern- und Prüfungsformen	Lehrveranstaltungsübergreifend durch Klausur; 90 Min.
Lerninhalte	The module "Advanced Automation" investigates emerging trends in automation, such as the Internet of Things (IoT), machine learning, artificial intelligence and new ways of developing programmable logic controllers (PLCs), which are transforming traditional automation practices. The students learn the fundamental concepts of embedded systems design, including hardware-software integration, real-time operating systems, and low-level programming. They explore the architecture of embedded devices, industrial networking, communication protocols. Emphasis is placed on the development of efficient algorithms and system optimization for resource-constrained environments, that independently interact in automated systems. Additionally, students gain insights into advanced methodologies for software engineering such as Agile, emphasizing collaborative software development and continuous integration. Topics include software architecture, testing methodologies, and the use of modern development tools. Together, these courses provide a robust foundation in both hardware and software aspects of engineering.
Fachkompetenz: Wissen und Verstehen (Lernziele)	The students • understand embedded systems and their boundary conditions and areas of application, using synergies with circuit technology (hardware-software co-design). • can develop and explain applications for embedded systems in the field of ‘short-range wireless networks’ (SRWN). • are proficient in processor architectures, in particular digital signal processors (DSP) and FPGAs • are proficient in ‘comparative design’ and hybrid architectures with microprocessors and FPGAs (hardware-software co-design). • understand design methods at system level. • know the basics, terms and key aspects of modern software development. • know the main phases of the software life cycle concept from requirements analysis to software maintenance. • understand how to manage software projects.

	• can explain and apply common process models and methods. • can differentiate between analysis, design and implementation. • understand software architecture and modelling, software quality, software verification and software maintenance.
Fachkompetenz: Fertigkeit, Wissenserschließung	The students • are able to evaluate GPP and FPGAs using parameters. • are able to discuss a GPP/FPGA solution. • apply the acquired knowledge to specific problems. • can familiarize themselves independently with complex embedded systems. are familiar with important microprocessor and FPGA platforms. • are able to manage software projects over the entire software life cycle. • can determine and allocate tools for the software development phases. • can create requirements analyses and project plans for software projects. • understand software architecture and modelling, software quality, software verification and software maintenance. • can apply the acquired knowledge to specific problems. • can present reports. can familiarize themselves independently with complex software topics.
Personale Kompetenz: Sozialkompetenz	The students • develop a methodical approach to gain in-depth knowledge. • work goal-orientated with other people such as employees and colleagues • develop a methodical approach to gain in-depth knowledge. • work goal-orientated and analytically in a team.

Personale Kompetenz: Selbständigkeit	The students • organise their own work processes effectively. • work independently and on their own responsibility. • deepen the contents and questions of the lecture independently. •
Kompetenzniveau gemäß DQR	7
Voraussetzungen für die Teilnahme	
Besonderheiten / Verwendbarkeit	
Terminierung im Stundenplan	https://splan.hs-heilbronn.de/splan/
Leistungsnachweis bei kombinierter Prüfung	

HOCHSCHULE HEILBRONN

Veranstaltung M3.1 293571 Embedded and Edge Systems

Diese Veranstaltung ist Pflichtveranstaltung im Modul M3

Lehrveranstaltungsverantwortliche(r)	Prof. Dr.-Ing. Ralf Gessler
Semester	1
Häufigkeit des Angebots	Wintersemester
Art der Veranstaltung	Vorlesung mit Übungen
Lehrsprache	Englisch
Leistungspunkte (ECTS)	2.5
SWS	2.0, dies entspricht einem Workload von 62.5 Stunden
Workload - Kontaktstunden	30
Workload - Selbststudium	32.5
Detailbemerkung zum Workload	
Prüfungsart	Lehrveranstaltung ohne Prüfung, hier: Prüfung auf Modulebene
Prüfungsdauer	
Verpflichtung	Pflichtmodul
Voraussetzungen für die Teilnahme	
Lehr-/Lernmethoden (Lehrformen)	Lecture with exercise Self-study • Follow-up of the lecture • Exercises • Literature study Accompanying exam preparation
Fachkompetenz: Wissen und Verstehen	The students • understand embedded systems and their boundary conditions and areas of application, using synergies with circuit technology (hardware-software co-design). • can develop and explain applications for embedded systems in the field of ‘short-range wireless networks’ (SRWN). • are proficient in processor architectures, in particular digital signal processors (DSP) and FPGAs • are proficient in ‘comparative design’ and hybrid architectures with microprocessors and FPGAs (hardware-software co-design). • understand design methods at system level.

Fachkompetenz: Fertigkeit und Wissenserschließung	The students • are able to evaluate GPP and FPGAs using parameters. • are able to discuss a GPP/FPGA solution. • apply the acquired knowledge to specific problems. • can familiarize themselves independently with complex embedded systems. • are familiar with important microprocessor and FPGA platforms.
Personale Kompetenz: Sozialkompetenz	The students • develop a methodical approach to gain in-depth knowledge. • work goal-orientated with other people such as employees and colleagues
Personale Kompetenz: Selbständigkeit	The students • organise their own work processes effectively. • work independently and on their own responsibility. • deepen the contents and questions of the lecture independently.
Kompetenzniveau gemäß DQR	7
Inhalte	• Introduction to Embedded Systems • Intro SRWN • Microprocessors (specialisation) • Architectures: i.e. CPU, GPU, FPU • Selected embedded processor architectures: i.e. ARM, RISC-V • Development process: phases and models • Digital signal processors (in-depth) • FPGA design with VHDL • Number systems and arithmetic • Evaluation numbers and Benchmarks • Hard software co-design • System-level design tools • EDA-Tools examples • Intro RTOS • Best practices • Comparison - GPP vs. FPGA - DSP vs. FPGA • Trends
Empfehlung für begleitende Veranstaltungen	
Sonstige Besonderheiten	Hands on workshop: FPGA design flow with VHDL; best practice examples
Literatur/Lernquellen	• Gessler, R.: Entwicklung Eingebetteter Systeme. Springer Vieweg, 2. Edition, 2020 • Charlie, Th.: Introduction to Embedded Systems. States Academic Press, 2022 • Vahid, F. and Givargis, T.: Embedded System Design: A Unified Hardware/Software Introduction, John Wiley & Sons, 2001 • Perry, D.: VHDL: Programming by Example, McGraw-Hill Education, 2002

	• Readler, B. C.: Digital Design from Scratch with VHDL in FPGAs: Volume 2, Running with Logical Legs. Full Arc Press, 2020 • Guy, W.: FreeRTOS for ESP32-Arduino: Practical Multitasking Fundamentals. Elektor, 2020 • Gessler, R.: Wireless-Netzwerke für den Nahbereich. Springer Vieweg, 2. Edition, 2015
Terminierung im Stundenplan	https://splan.hs-heilbronn.de/splan/
Leistungsnachweis bei kombinierter Prüfung	

HOCHSCHULE HEILBRONN

Veranstaltung M3.2 293572 Industrial Software Engineering

Diese Veranstaltung ist Pflichtveranstaltung im Modul M3

Lehrveranstaltungsverantwortliche(r)	Prof. Dr.-Ing. Ralf Gessler
Semester	1
Häufigkeit des Angebots	Wintersemester
Art der Veranstaltung	Vorlesung mit Übungen
Lehrsprache	Englisch
Leistungspunkte (ECTS)	2.5
SWS	2.0, dies entspricht einem Workload von 62.5 Stunden
Workload - Kontaktstunden	30
Workload - Selbststudium	32.5
Detailbemerkung zum Workload	
Prüfungsart	Lehrveranstaltung ohne Prüfung, hier: Prüfung auf Modulebene
Prüfungsdauer	
Verpflichtung	Pflichtmodul
Voraussetzungen für die Teilnahme	
Lehr-/Lernmethoden (Lehrformen)	Lecture with exercise Self-study • Follow-up of the lecture • Exercises • Literature study • Accompanying exam preparation
Fachkompetenz: Wissen und Verstehen	The students • know the basics, terms and key aspects of modern software development. • know the main phases of the software life cycle concept from requirements analysis to software maintenance. • understand how to manage software projects. • can explain and apply common process models and methods. • can differentiate between analysis, design and implementation. • understand software architecture and modelling, software quality, software verification and software maintenance.

Fachkompetenz: Fertigkeit und Wissenserschließung	The students • are able to manage software projects over the entire software life cycle. • can determine and allocate tools for the software development phases. • can create requirements analyses and project plans for software projects. • understand software architecture and modelling, software quality, software verification and software maintenance. • can apply the acquired knowledge to specific problems. • can present reports. • can familiarize themselves independently with complex software topics.
Personale Kompetenz: Sozialkompetenz	The students • develop a methodical approach to gain in-depth knowledge • work goal-orientated and analytically in a team.
Personale Kompetenz: Selbständigkeit	The students • organize their own work processes effectively. • work independently and on their own responsibility. • deepen the contents and questions of the lecture independently.
Kompetenzniveau gemäß DQR	7
Inhalte	• Intro to Software Engineering: basics and terms • Software requirements • Design methodology and strategies • Elements: QM, PM, CM • Managing software projects with classic methods • Managing software projects with agile methods • Modelling: forms of abstraction • Requirements management • Object oriented analysis and design • UML advanced • Clean Code • Software quality assurance and testing (MCDC test procedures) • Overview OS • IDE-Tools examples • Best practices • Comparison - Classic vs. agile - Program languages - UML models • Trends
Empfehlung für begleitende Veranstaltungen	
Sonstige Besonderheiten	Hands on workshop: ESP32 design flow with C++ (i.e. Arduino); best practice examples

Literatur/Lernquellen	• Gessler, R.: Entwicklung Eingebetteter Systeme. Springer Vieweg, 2. Auflage, 2020 • Sommerville, I.: Software Engineering. Global Edition. Pearson, 10. Edition, 2015 • Livingston J., D.: Learning Object Oriented Programming through C++: A Beginner's Guide for Learning OOP. Notion Press, 2021 • Fowler, Martin: UML Distilled: A Brief Guide to the Standard Object Modelling Language. Pearson International, 3. Auflage, 2018 • Boehm, B: Get Ready for Agile Methods, with Care. A good discussion of the pros and cons of agile methods such as extreme programming by a leading software engineering practitioner and researcher, IEEE Computer, 35 (4), Januar 2002 • Beizer B.: Black-Box Testing - Techniques for Functional Testing of Software and Systems, John Wiley & Sons, New York, 1995
Terminierung im Stundenplan	https://splan.hs-heilbronn.de/splan/
Leistungsnachweis bei kombinierter Prüfung	

HOCHSCHULE HEILBRONN

Modul M4 293580 Intelligent Data Systems

Dauer des Moduls	1 Semester
SWS	4.0
Prüfungsart	Lehrveranstaltungsübergreifend durch Klausur
Prüfungsdauer	90 Minuten
Leistungspunkte (ECTS)	5.0
Voraussetzungen für die Vergabe von Leistungspunkten	
Modulverantwortliche(r)	Prof. Dr.-Ing. Ingmar Groh
Lehr-, Lern- und Prüfungsformen	Lehrveranstaltungsübergreifend durch Klausur; 90 Min.
Lerninhalte	The module "Intelligent Data Systems" focuses on the integration of advanced data management techniques with intelligent algorithms to enhance decision-making processes in various applications. It covers fundamental concepts of data systems, including data collection, storage, and retrieval methods. Students learn to use machine learning and artificial intelligence techniques, for example for classification, regression, clustering, and anomaly detection. Emphasis is placed on the application of these techniques in real-world scenarios, such as time series analysis of industrial data and predictive maintenance and by implementing intelligent data systems, utilizing tools and programming languages such as Python.
Fachkompetenz: Wissen und Verstehen (Lernziele)	The students • are familiar with core AI concepts, including machine learning, neural networks, and data-driven decision-making • understand and implement various AI and machine learning algorithms for real-world applications. • know how to integrate AI technologies with existing technical systems and IoT devices for enhanced functionality • understand the ethical implications of AI technologies, including biases and societal impacts, leading to responsible AI use. • are aware of current trends and advancements in AI technologies. • understand the role of data analyses in industrial processes • can master tools and techniques for analyzing large industrial data sets • gain an understanding of modern approaches in the data-driven industry such as predictive maintenance, process optimization and IoT.
Fachkompetenz: Fertigkeit, Wissenserschließung	The students are able to • develop, train, and validate AI models tailored to specific technical challenges.

	• use problem-solving skills for engineering problems with AI solutions. • to apply methods of data preparation, analysis and interpretation • to implement analytical models in production environments.
Personale Kompetenz: Sozialkompetenz	The students • work out solutions in groups, discuss them and check their plausibility. • deal with problems in the team with foresight. • are able to work in a team-oriented manner and achieve good results in the group. • can present and represent the results of the group's work and lead interdisciplinary discussions.
Personale Kompetenz: Selbständigkeit	The students • use complex technical devices proactively and conscientiously. deepen the questions of the lecture independently.
Kompetenzniveau gemäß DQR	7
Voraussetzungen für die Teilnahme	
Besonderheiten / Verwendbarkeit	
Terminierung im Stundenplan	https://splan.hs-heilbronn.de/splan/
Leistungsnachweis bei kombinierter Prüfung	

HOCHSCHULE HEILBRONN

Veranstaltung M4.1 293581 Artificial Intelligence in Technical Systems

Diese Veranstaltung ist Pflichtveranstaltung im Modul M4

Lehrveranstaltungsverantwortliche(r)	Prof. Dr.-Ing. Ingmar Groh
Semester	2
Häufigkeit des Angebots	Sommersemester
Art der Veranstaltung	Vorlesung mit Übungen
Lehrsprache	Englisch
Leistungspunkte (ECTS)	2.5 dies entspricht einem Workload von 62.5 Stunden
SWS	2 SWS
Workload - Kontaktstunden	30
Workload - Selbststudium	32.5
Detailbemerkung zum Workload	
Prüfungsart	Lehrveranstaltung ohne Prüfung, hier: Prüfung auf Modulebene
Prüfungsdauer	
Verpflichtung	Pflichtmodul
Voraussetzungen für die Teilnahme	
Lehr-/Lernmethoden (Lehrformen)	Lecture with exercise Self-study • Follow-up of the lecture • Exercises • Literature study • Accompanying exam preparation
Fachkompetenz: Wissen und Verstehen	The students • are familiar with core AI concepts, including machine learning, neural networks, and data-driven decision-making • understand and implement various AI and machine learning algorithms for real-world applications. • know how to integrate AI technologies with existing technical systems and IoT devices for enhanced functionality • understand the ethical implications of AI technologies, including biases and societal impacts, leading to responsible AI use. • are aware of current trends and advancements in AI technologies.

Fachkompetenz: Fertigkeit und Wissenserschließung	The students are able to • develop, train, and validate AI models tailored to specific technical challenges. • use problem-solving skills for engineering problems with AI solutions.
Personale Kompetenz: Sozialkompetenz	The students • work out solutions in groups, discuss them and check their plausibility • deal with problems in the team with foresight.
Personale Kompetenz: Selbständigkeit	The students • use complex technical devices proactively and conscientiously. • deepen the questions of the lecture independently. • can use the knowledge and skills they have acquired to work on new application- and research-orientated tasks in a targeted manner. • know the scope and effects of individual system requirements.
Kompetenzniveau gemäß DQR	7
Inhalte	• Introduction to AI • Machine Learning paradigms • AI application areas and AI in engineering like control systems, robotics, and automation • AI techniques for predictive maintenance and fault detection in technical systems • Optimization and decision making • Smart Systems and IoT • Trends in AI • Ethical and Social Considerations • Case Studies
Empfehlung für begleitende Veranstaltungen	
Sonstige Besonderheiten	
Literatur/Lernquellen	• Joshi, A.: Machine Learning and Artificial Intelligence, Cham, 2020 • Hulten, G.: Building Intelligent Systems: A Guide to Machine Learning Engineering, Apress, 2018 • Ng, A.: Machine Learning Yearning: Technical Strategy for AI Engineers in the Era of Deep Learning, deeplearning.ai, 2018 • Deligiannidis, L.; Dimitoglou, G.; Arabnia, H.: Artificial intelligence: machine learning, convolutional neural networks and large language models. De Gruyter, 2024 • Chakir, A.; Andry, J. et. al.: Engineering Applications of Artificial Intelligence. Springer, 2024 • Bonaccorso, G.; Fandango, A.; Shanmugamani, R.: Advanced Guide to Artificial Intelligence: Expert machine learning systems and intelligent agents using Python. Packt Publishing, 2018
Terminierung im Stundenplan	https://splan.hs-heilbronn.de/splan/

Leistungsnachweis bei kombinierter Prüfung	

HOCHSCHULE HEILBRONN

Veranstaltung M4.2 293582 Industrial Data Analytics

Diese Veranstaltung ist Pflichtveranstaltung im Modul M4

Lehrveranstaltungsverantwortliche(r)	
Semester	2
Häufigkeit des Angebots	Sommersemester
Art der Veranstaltung	Vorlesung mit Übungen
Lehrsprache	Englisch
Leistungspunkte (ECTS)	2.5
SWS	2.0, dies entspricht einem Workload von 62.5 Stunden
Workload - Kontaktstunden	30
Workload - Selbststudium	32.5
Detailbemerkung zum Workload	
Prüfungsart	Lehrveranstaltung ohne Prüfung, hier: Prüfung auf Modulebene
Prüfungsdauer	
Verpflichtung	Pflichtmodul
Voraussetzungen für die Teilnahme	
Lehr-/Lernmethoden (Lehrformen)	Lecture with exercise Self-study • Follow-up of the lecture • Exercises • Literature study • Accompanying exam preparation
Fachkompetenz: Wissen und Verstehen	The students • understand the role of data analyses in industrial processes • can master tools and techniques for analyzing large industrial data sets • gain an understanding of modern approaches in the data-driven industry such as predictive maintenance, process optimization and IoT.
Fachkompetenz: Fertigkeit und Wissenserschließung	The students are able • to apply methods of data preparation, analysis and interpretation • to implement analytical models in production environments.
Personale Kompetenz: Sozialkompetenz	The students • are able to work in a team-oriented manner and achieve good results in the group.

	• can present and represent the results of the group's work and lead interdisciplinary discussions.
Personale Kompetenz: Selbständigkeit	The students • can use the knowledge and skills they have acquired to work on new application- and research-orientated tasks in a targeted manner. • know the scope and effects of individual system requirements.
Kompetenzniveau gemäß DQR	7
Inhalte	• Overview of Industrial Data Analytics • Data sources in industry (machine data, ERP systems, sensors) • Algorithms and models • Time series analysis and predictive maintenance • Use-cases in industry: quality assurance, error detection, optimization • Exercise in Python Jupiter Notebooks (structures, formats, libraries, data visualization) • Case studies (analysis of real industrial data sets)
Empfehlung für begleitende Veranstaltungen	
Sonstige Besonderheiten	
Literatur/Lernquellen	• Data Analytics: Models and Algorithms for Intelligent Data Analysis. 3. Auflage, Springer, 2020 • Hill, R.; Berry, S.: Guide to Industrial Analytics: Solving Data Science Problems for Manufacturing and the Internet of Things. Springer, 2021 • Wintjen, M.: Practical Data Analysis Using Jupyter Notebook. Packt Publishing, 2020
Terminierung im Stundenplan	https://splan.hs-heilbronn.de/splan/
Leistungsnachweis bei kombinierter Prüfung	

Modul M5 293590 Strategic Technologies 1

Dauer des Moduls	1 Semester
SWS	4.0
Prüfungsart	Lehrveranstaltungsübergreifend durch Klausur
Prüfungsdauer	90 Minuten
Leistungspunkte (ECTS)	5.0
Voraussetzungen für die Vergabe von Leistungspunkten	
Modulverantwortliche(r)	Prof. Dr.-Ing. Marcus Stolz
Lehr-, Lern- und Prüfungsformen	Lehrveranstaltungsübergreifend durch Klausur; 90 Min.
Lerninhalte	The module "Strategic Technologies 1" is designed to provide students with a comprehensive understanding of emerging or key technologies that have the potential to shape industries and societies. This module comprises various elective courses, allowing students to tailor their learning experiences based on personal interests and career aspirations.
Fachkompetenz: Wissen und Verstehen (Lernziele)	The students • are familiar with the latest trends and advancements in power electronics, including new materials and technologies. • understand of thermal management techniques to ensure the reliable operation of power electronic devices under varying environmental conditions. • understand the function and structure of electro-magneto-mechanical energy converters. • are able to simulate and design electro-magneto-mechanical converters. .
Fachkompetenz: Fertigkeit, Wissenserschließung	The students are able to • design and optimize various power electronic topologies for different applications, considering efficiency, cost, and reliability. • implement advanced control strategies for power converters, enabling precise regulation and improved system performance. • use simulation tools and software to model power electronic circuits. • solve hands-on projects that require troubleshooting and innovative solutions. • have knowledge of the design, simulation and operation of energy converters accompanied by practical examples. • acquire knowledge with the help of modelling electromagnetic-mechanical converters.
Personale Kompetenz: Sozialkompetenz	The students • work goal-orientated and analytically in a team.

	• know the advantages of thinking in variants and can deal with competing points of view. • can apply problem-solving techniques. • work out solutions in groups, discuss them and check their plausibility.

Personale Kompetenz: Selbständigkeit	The sudents • use complex technical equipment and experimental set-ups proactively and conscientiously. • deepen their knowledge from the lecture in laboratory experiments. • deepen the questions of the lecture independently. • work independently and on their own responsibility. • familiarize themselves with scientific publications.
Kompetenzniveau gemäß DQR	7
Voraussetzungen für die Teilnahme	
Besonderheiten / Verwendbarkeit	
Terminierung im Stundenplan	https://splan.hs-heilbronn.de/splan/
Leistungsnachweis bei kombinierter Prüfung	

HOCHSCHULE HEILBRONN

Veranstaltung M5.1 293591 Development of Power Electronics

Diese Veranstaltung ist Wahlpflichtveranstaltung im Modul M5

Lehrveranstaltungsverantwortliche(r)	Prof. Dr.-Ing. Marcus Stolz (LB WE?)
Semester	1
Häufigkeit des Angebots	Wintersemester
Art der Veranstaltung	Vorlesung mit Übungen
Lehrsprache	Englisch
Leistungspunkte (ECTS)	2.5
SWS	2.0, dies entspricht einem Workload von 62.5 Stunden
Workload - Kontaktstunden	30
Workload - Selbststudium	32.5
Detailbemerkung zum Workload	
Prüfungsart	Lehrveranstaltung ohne Prüfung, hier: Prüfung auf Modulebene
Prüfungsdauer	
Verpflichtung	Wahlpflichtmodul
Voraussetzungen für die Teilnahme	
Lehr-/Lernmethoden (Lehrformen)	Lecture with exercise Self-study • Follow-up of the lecture • Exercises • Literature study • Accompanying exam preparation
Fachkompetenz: Wissen und Verstehen	The students • are familiar with the latest trends and advancements in power electronics, including new materials and technologies. • understand of thermal management techniques to ensure the reliable operation of power electronic devices under varying environmental conditions. .

Fachkompetenz: Fertigkeit und Wissenserschließung	The students are able to • design and optimize various power electronic topologies for different applications, considering efficiency, cost, and reliability. • implement advanced control strategies for power converters, enabling precise regulation and improved system performance. • use simulation tools and software to model power electronic circuits. • solve hands-on projects that require troubleshooting and innovative solutions.
Personale Kompetenz: Sozialkompetenz	The students • work goal-orientated and analytically in a team. • know the advantages of thinking in variants and can deal with competing points of view. • can apply problem-solving techniques.
Personale Kompetenz: Selbständigkeit	The sudents • use complex technical equipment and experimental set-ups proactively and conscientiously. • deepen their knowledge from the lecture in laboratory experiments.
Kompetenzniveau gemäß DQR	7
Inhalte	• Review of basic principles • Advanced Converter Topologies • Control Strategies • Electromagnetic Compatibility (EMC) • Thermal Management • Applications of Power Electronics in mobile application as electric vehicles but also in renewable energy systems (solar and wind) or industrial automation. • Simulation and Modeling • Emerging Trends as new power semiconductor devices, wide bandgap materials, and their implications for future power electronics applications. • Project Work
Empfehlung für begleitende Veranstaltungen	
Sonstige Besonderheiten	

Literatur/Lernquellen	• Erickson, R.; Maksimovic, D.: Fundamentals of Power Electronics. 3. Auflage, Springer, 2020. • Wicht, B.: Design of Power Management Integrated Circuits. Wiley-IEEE Press, 2024. • Baliga, B.: Modern Silicon Carbide Power Devices. World Scientific Publishing Company, 2023. • Zhou, L.; Preindl, M.: Software-Defined Power Electronics: Converter Configuration, Control, and Optimization. Springer, 2024.

Terminierung im Stundenplan	https://splan.hs-heilbronn.de/splan/
Leistungsnachweis bei kombinierter Prüfung	

Veranstaltung M5.2 293592 Electric, Magnetic, and Mechanic Energy Converters

Diese Veranstaltung ist Wahlpflichtveranstaltung im Modul 5

Lehrveranstaltungsverantwortliche(r)	Prof. Dr.-Ing. Jürgen Ulm
Semester	1
Häufigkeit des Angebots	Wintersemester
Art der Veranstaltung	Vorlesung mit Übungen
Lehrsprache	Englisch
Leistungspunkte (ECTS)	2.5
SWS	2.0, dies entspricht einem Workload von 62.5 Stunden
Workload - Kontaktstunden	30
Workload - Selbststudium	32.5
Detailbemerkung zum Workload	
Prüfungsart	Lehrveranstaltung ohne Prüfung, hier: Prüfung auf Modulebene
Prüfungsdauer	
Verpflichtung	Wahlpflichtmodul
Voraussetzungen für die Teilnahme	
Lehr-/Lernmethoden (Lehrformen)	Lecture with exercise Self-study • Follow-up of the lecture • Exercises • Literature study • Accompanying exam preparation The introduction to the theory of magnetic circuits is followed by familiarization with simulation software for simulating magnetic actuators. This approach enables the connection between theoretical knowledge and the design process of the energy converters.
Fachkompetenz: Wissen und Verstehen	The students • understand the function and structure of electro-magneto-mechanical energy converters. • are able to simulate and design electro-magneto-mechanical converters.

Fachkompetenz: Fertigkeit und Wissenserschließung	The students • have knowledge of the design, simulation and operation of energy converters accompanied by practical examples. • acquire knowledge with the help of modelling electromagnetic-mechanical converters.
Personale Kompetenz: Sozialkompetenz	The students • work out solutions in groups, discuss them and check their plausibility.
Personale Kompetenz: Selbständigkeit	The students • deepen the questions of the lecture independently. • work independently and on their own responsibility. • familiarize themselves with scientific publications.
Kompetenzniveau gemäß DQR	7
Inhalte	• Fundamentals of electromagnetism • Soft and hard magnetic materials • Energy of the magnetic circuit • the electromagnet as a stationary energy converter • the electromagnet as a dynamic energy converter • Electrical control of electromagnets • Structure and technology of the excitation coil • Coil design for highly dynamic applications • Highly dynamic solenoid actuators • Thermal consideration of the electromagnet • Design of electromagnetic drives • Scaling of electromagnets • Optimisation of electromagnetic actuators • Non-destructive material testing • Sensorless armature position and armature speed detection
Empfehlung für begleitende Veranstaltungen	
Sonstige Besonderheiten	The lecture content and the lecture are fuelled by findings from our own research activities.
Literatur/Lernquellen	• Kallenbach, E.; Eick, R.; u.a.: Elektromagnete - Grundlagen, Berechnung, Entwurf und Anwendung, 4. Auflage, Vieweg +Teubner, Wiesbaden, 2012 • Ströhla, T.: Ein Beitrag zur Simulation und zum Entwurf von elektromagnetischen Systemen mit Hilfe der Netzwerkmethode, 1. Auflage, Wissenschaftsverlag Ilmenau, 2002 • Ulm, J.: Optimierung von schnellwirkenden elektromagnetischen Antrieben, 1. Auflage, ISLE, Ilmenau, 2007 • Ulm, J.: Numerische Lösung gewöhnlicher und partieller Differenzialgleichungen, 1. Auflage, Expert, 2017
Terminierung im Stundenplan	https://splan.hs-heilbronn.de/splan/

Leistungsnachweis bei kombinierter Prüfung	

Modul M6 293600 Strategic Technologies 2

Dauer des Moduls	1 Semester
SWS	4.0
Prüfungsart	Lehrveranstaltungsübergreifend durch Klausur
Prüfungsdauer	90 Minuten
Leistungspunkte (ECTS)	5.0
Voraussetzungen für die Vergabe von Leistungspunkten	
Modulverantwortliche(r)	Prof. Dr.-Ing. Marcus Stolz
Lehr-, Lern- und Prüfungsformen	Lehrveranstaltungsübergreifend durch Klausur; 90 Min.
Lerninhalte	The module "Strategic Technologies 2" is designed to provide students with a comprehensive understanding of emerging or key technologies that have the potential to shape industries and societies. This module comprises various elective courses, allowing students to tailor their learning experiences based on personal interests and career aspirations.
Fachkompetenz: Wissen und Verstehen (Lernziele)	The students • know the process of image processing projects. • understand the technical aspects of image acquisition (lighting, cameras, lens systems). • know typical image processing algorithms and can differentiate between them. • categorize automation systems in typical classifications. • know the procedure for planning automated systems for product processing and packaging. • can design basic procedures for handling different workpieces and develop handling processes for given products (assembly plans). • optimise process reliability or costs by adapting the handling process • are able to select application-related production measurement methods. • are familiar with digital planning tools.
Fachkompetenz: Fertigkeit, Wissenserschließung	Students are able to • analyse given requirements and outline a procedure. • select and implement suitable image processing operations. • solve specific problems using Matlab. • design assembly processes. • optimise products with regard to their automation capability. • calculate the economic efficiency of a production system or select the most favourable variant.
Personale Kompetenz: Sozialkompetenz	The students • work together with others in a goal-orientated manner. • achieve work results in groups and document them.

Personale Kompetenz: Selbständigkeit	The students deepen the questions of the lecture independently.
Kompetenzniveau gemäß DQR	7
Voraussetzungen für die Teilnahme	
Besonderheiten / Verwendbarkeit	
Terminierung im Stundenplan	https://splan.hs-heilbronn.de/splan/
Leistungsnachweis bei kombinierter Prüfung	

Veranstaltung M6.1 293601 Computer Vision

Diese Veranstaltung ist Wahlpflichtveranstaltung im Modul 6

Lehrveranstaltungsverantwortliche(r)	Prof. Dr.-Ing. Marcus Stolz
Semester	2
Häufigkeit des Angebots	Sommersemester
Art der Veranstaltung	Vorlesung mit Übungen
Lehrsprache	Englisch
Leistungspunkte (ECTS)	2.5
SWS	2.0, dies entspricht einem Workload von 62.5 Stunden
Workload - Kontaktstunden	30 hours per semester
Workload - Selbststudium	32.5 hours per semester
Detailbemerkung zum Workload	
Prüfungsart	Lehrveranstaltung ohne Prüfung, hier: Prüfung auf Modulebene
Prüfungsdauer	
Verpflichtung	Wahlpflichtmodul
Voraussetzungen für die Teilnahme	
Lehr-/Lernmethoden (Lehrformen)	Lecture with exercise Self-study • Follow-up of the lecture • Exercises • Literature study Accompanying exam preparation
Fachkompetenz: Wissen und Verstehen	The students • know the process of image processing projects. • understand the technical aspects of image acquisition (lighting, cameras, lens systems). • know typical image processing algorithms and can differentiate between them.

Fachkompetenz: Fertigkeit und Wissenserschließung	Students are able to • analyse given requirements and outline a procedure. • select and implement suitable image processing operations. • solve specific problems using Matlab.
Personale Kompetenz: Sozialkompetenz	The students • work together with others in a goal-orientated manner. • achieve work results in groups and document them.

Personale Kompetenz: Selbständigkeit	The students • deepen the questions of the lecture independently.
Kompetenzniveau gemäß DQR	7
Inhalte	• Basics of Matlab • Basics of computer-aided image processing (image formats, computer graphics) • Lighting techniques • Lens systems and imaging errors • Image processing operations (2D/3D) • Machine learning algorithms in computer vision
Empfehlung für begleitende Veranstaltungen	
Sonstige Besonderheiten	
Literatur/Lernquellen	• Gonzalez, R., Woods, R.: Digital Image Processing. 4. Auflage, Pearson, 2018 . • Burger, W.; Burge, M.: Digital Image Processing: An Algorithmic Introduction. Springer, 2022 . • Prince, S.: Computer Vision: Models, Learning, and Inference. Cambridge University Press, 2012. • Zhang, Y.: 3D Computer Vision: Foundations and Advanced Methodologies. Springer, 2024.
Terminierung im Stundenplan	https://splan.hs-heilbronn.de/splan/
Leistungsnachweis bei kombinierter Prüfung	

Veranstaltung M6.2 293602 Assembly and Handling Systems

Diese Veranstaltung ist Wahlpflichtveranstaltung im Modul 6

Lehrveranstaltungsverantwortliche(r)	Prof. Dr.-Ing. Marcus Stolz
Semester	2
Häufigkeit des Angebots	Sommersemester
Art der Veranstaltung	Vorlesung mit Übungen
Lehrsprache	Englisch
Leistungspunkte (ECTS)	2.5
SWS	2.0, dies entspricht einem Workload von 62.5 Stunden
Workload - Kontaktstunden	30 hours per semester
Workload - Selbststudium	32.5 hours per semester
Detailbemerkung zum Workload	
Prüfungsart	Lehrveranstaltung ohne Prüfung, hier: Prüfung auf Modulebene
Prüfungsdauer	
Verpflichtung	Wahlpflichtmodul
Voraussetzungen für die Teilnahme	
Lehr-/Lernmethoden (Lehrformen)	Lecture with exercise Self-study • Follow-up of the lecture • Exercises • Literature study Accompanying exam preparation

Fachkompetenz: Wissen und Verstehen	The students • categorize automation systems in typical classifications. • know the procedure for planning automated systems for product processing and packaging. • can design basic procedures for handling different workpieces and develop handling processes for given products (assembly plans). • optimise process reliability or costs by adapting the handling process • are able to select application-related production measurement methods. • are familiar with digital planning tools.
Fachkompetenz: Fertigkeit und Wissenserschließung	The students • design assembly processes. • optimise products with regard to their automation capability. • calculate the economic efficiency of a production system or • select the most favourable variant.

Personale Kompetenz: Sozialkompetenz	The students • work together with others in a goal-orientated way.
Personale Kompetenz: Selbständigkeit	The students • deepen the issues of the lecture independently.
Kompetenzniveau gemäß DQR	7
Inhalte	• Classification of work equipment, • Application of handling equipment (assembly, packaging, storage) • Storage and feeding systems • Orientation and movement of workpieces • Quality management in handling technology, • Production metrology and logistics • Storage technology • Simulation of handling systems
Empfehlung für begleitende Veranstaltungen	
Sonstige Besonderheiten	Where possible, the lecture is supplemented by industry-specific presentations from local industry representatives. The focus here is on packaging technology e.g. handling & packaging of food and pharmaceutical products.

Literatur/Lernquellen	• Hesse, S., Malisa, V.: Grundlagen der Handhabungstechnik. 6. Auflage, Hanser, München, 2024 • Marxer, M.; Bach, C.; Keferstein, C. P.: Fertigungsmesstechnik: alles zu Messunsicherheit, konventioneller Messtechnik und Multisensorik. 10. Auflage, Springer Vieweg, Wiesbaden, 2021 • Boothroyd, G.; Dewhurst, P.; Knight, W.: Product Design for Manufacture and Assembly. CRC Press, 2011 • Ihlenfeldt, S.; Schüppstuhl, T.; Tracht, K.: Annals of Scientific Society for Assembly, Handling and Industrial Robotics. Springer, Cham, 2023
Terminierung im Stundenplan	https://splan.hs-heilbronn.de/splan/
Leistungsnachweis bei kombinierter Prüfung	

Modul M7 293610 Portfolio Optimization 1

Dauer des Moduls	1 Semester
SWS	4.0
Prüfungsart	Abhängig von zu wählenden Veranstaltungen
Prüfungsdauer	
Leistungspunkte (ECTS)	5.0
Voraussetzungen für die Vergabe von Leistungspunkten	
Modulverantwortliche(r)	Prof. Dr.-Ing. Marcus Stolz
Lehr-, Lern- und Prüfungsformen	Abhängig von gewählten Veranstaltungen
Lerninhalte	Students with no knowledge of German language or below A1 level should attend the course "German as a foreign language 1" to provide the skills to cope with everyday situations in Germany. Students with language skills above A1 should take "Advised Studies" to improve individual skills based on a learning agreement with their representative study guide.
Fachkompetenz: Wissen und Verstehen (Lernziele)	Mastery of all language skills (listening, reading, writing, speaking) at level A1 • Self-reflection • Identification of weaknesses
Fachkompetenz: Fertigkeit, Wissenserschließung	A1 Germans course provides basic language skills. Learners gain the ability to introduce themselves, ask and answer simple questions, and understand everyday phrases related to familiar topics, such as greetings, personal information, and daily routines. Additionally, they learn foundational grammar, including the present tense and basic sentence structure, enabling them to communicate at a basic level in German-speaking settings, like ordering food or asking for directions. This course emphasizes listening, speaking, reading, and writing skills for simple, routine interactions. • Self-controlled learning
Personale Kompetenz: Sozialkompetenz	The students • take responsibility in a team. • work together with others in a goal-orientated manner. • achieve work results in groups and document them. • discussion about own weaknesses
Personale Kompetenz: Selbständigkeit	The students • carry out a literature study on their own responsibility. • repeat and deepen the learning content independently • increase self-discipline • improve time management

Kompetenzniveau gemäß DQR	7
Voraussetzungen für die Teilnahme	

Besonderheiten / Verwendbarkeit	
Terminierung im Stundenplan	https://splan.hs-heilbronn.de/splan/
Leistungsnachweis bei kombinierter Prüfung	

HOCHSCHULE HEILBRONN

Veranstaltung M7.1 293611 German as a Foreign Language 1

Diese Veranstaltung ist Wahlpflichtveranstaltung im Modul 7

Lehrveranstaltungsverantwortliche(r)	N.N. (Goethe Institut Schwäbisch Hall)
Semester	1 / 2
Häufigkeit des Angebots	Winter- und Sommersemester
Art der Veranstaltung	Sprachkurs
Lehrsprache	Englisch/ Deutsch
Leistungspunkte (ECTS)	5.0, dies entspricht einem Workload von 125 Stunden
SWS	4.0
Workload - Kontaktstunden	60
Workload - Selbststudium	65
Detailbemerkung zum Workload	
Prüfungsart	Lehrveranstaltungsbegleitend durch kombinierte Prüfung mit Klausur als abschließender Prüfung
Prüfungsdauer	90
Verpflichtung	Wahlmodul
Voraussetzungen für die Teilnahme	
Lehr-/Lernmethoden (Lehrformen)	
Fachkompetenz: Wissen und Verstehen	Mastery of all language skills (listening, reading, writing, speaking) at level A1

Fachkompetenz: Fertigkeit und Wissenserschließung	A1 Germans course provides basic language skills. Learners gain the ability to introduce themselves, ask and answer simple questions, and understand everyday phrases related to familiar topics, such as greetings, personal information, and daily routines. Additionally, they learn foundational grammar, including the present tense and basic sentence structure, enabling them to communicate at a basic level in German-speaking settings, like ordering food or asking for directions. This course emphasizes listening, speaking, reading, and writing skills for simple, routine interactions.
Personale Kompetenz: Sozialkompetenz	The students • take responsibility in a team. • work together with others in a goal-orientated manner. • achieve work results in groups and document them.

Personale Kompetenz: Selbständigkeit	The students • carry out a literature study on their own responsibility. • repeat and deepen the learning content independently
Kompetenzniveau gemäß DQR	
Inhalte	Orientate themselves to an A1 textbook
Empfehlung für begleitende Veranstaltungen	
Sonstige Besonderheiten	
Literatur/Lernquellen	
Terminierung im Stundenplan	https://splan.hs-heilbronn.de/splan/
Leistungsnachweis bei kombinierter Prüfung	

HOCHSCHULE HEILBRONN

Veranstaltung M7.2 293612 Advised Studies

Diese Veranstaltung ist Wahlpflichtveranstaltung im Modul 7

Lehrveranstaltungsverantwortliche(r)	Prof. Dr.-Ing. Marcus Stolz
Semester	1 / 2
Häufigkeit des Angebots	Winter- und Sommersemester
Art der Veranstaltung	Vorlesung / Seminar
Lehrsprache	Abhängig von gewählten Veranstaltungen
Leistungspunkte (ECTS)	5.0, dies entspricht einem Workload von 125 Stunden
SWS	4.0
Workload - Kontaktstunden	Abhängig von gewählten Veranstaltungen
Workload - Selbststudium	Abhängig von gewählten Veranstaltungen
Detailbemerkung zum Workload	Selection of courses in the fields of Studium Generale (especially languages) or otherwise departments of TW, TP or IT. The students suggest a study agreement and discuss this with their representative study guide.
Prüfungsart	Lehrveranstaltungsbegleitend durch kombinierte Prüfung mit Klausur als abschließender Prüfung
Prüfungsdauer	90
Verpflichtung	Wahlmodul
Voraussetzungen für die Teilnahme	
Lehr-/Lernmethoden (Lehrformen)	• Creation / Modification of a learning agreement • Depending on chosen lectures
Fachkompetenz: Wissen und Verstehen	• Self-reflection • Identification of weaknesses
Fachkompetenz: Fertigkeit und Wissenserschließung	• Self-controlled learning
Personale Kompetenz: Sozialkompetenz	• Discussion about own weaknesses
Personale Kompetenz: Selbständigkeit	• Self-discipline • Time management
Kompetenzniveau gemäß DQR	6 / 7 (depending on defined topics)

Inhalte	• The student analyses his / her skills and identifies weaknesses which he / she wants to iron out by one of the following: • attending lectures of the Heilbronn University • attending online courses • working on literature • designing / implementing a personal project The phases of the course are: • identifying weaknesses • creating / modifying a learning agreement including milestones • several status reports during the semester • final report with a kind of proof of success (exam, running project, oral exam, presentation, ...)
Empfehlung für begleitende Veranstaltungen	
Sonstige Besonderheiten	
Literatur/Lernquellen	
Terminierung im Stundenplan	
Leistungsnachweis bei kombinierter Prüfung	

HOCHSCHULE HEILBRONN

Modul M8 293620 Portfolio Optimization 2

Dauer des Moduls	1 Semester
SWS	4.0
Prüfungsart	Abhängig von gewählten Veranstaltungen
Prüfungsdauer	
Leistungspunkte (ECTS)	5.0
Voraussetzungen für die Vergabe von Leistungspunkten	
Modulverantwortliche(r)	Prof. Dr.-Ing. Marcus Stolz
Lehr-, Lern- und Prüfungsformen	Abhängig von gewählten Veranstaltungen
Lerninhalte	Students with knowledge of German language below A2 level should attend the course "German as a foreign language 2" to provide the skills to speak German in companies. Students with language skills above A2 take "Advised Studies" to improve individual skills based on a learning agreement with their representative study guide.
Fachkompetenz: Wissen und Verstehen (Lernziele)	Mastery of all language skills (listening, reading, writing, speaking) at level A2 • Self-reflection • Identification of weaknesses
Fachkompetenz: Fertigkeit, Wissenserschließung	A2 German courses provides foundational language skills, focusing on basic communication in everyday situations. Students develop abilities in reading, writing, speaking, and understanding simple conversations on topics like shopping, travel, work, and hobbies. They learn to use simple sentences and expressions, ask and answer questions about familiar topics, and describe personal background, immediate needs, and routine tasks. Self-controlled learning
Personale Kompetenz: Sozialkompetenz	The students • take responsibility in a team. • work together with others in a goal-orientated manner. • achieve work results in groups and document them. • discussion about own weaknesses
Personale Kompetenz: Selbständigkeit	The students • carry out a literature study on their own responsibility. • repeat and deepen the learning content independently. • Improve self-discipline and time-management
Kompetenzniveau gemäß DQR	7
Voraussetzungen für die Teilnahme	

Besonderheiten / Verwendbarkeit	
Terminierung im Stundenplan	https://splan.hs-heilbronn.de/splan/
Leistungsnachweis bei kombinierter Prüfung	

HOCHSCHULE HEILBRONN

Veranstaltung M8.1 293621 German as a Foreign Language 2

Diese Veranstaltung ist eine Wahlpflichtveranstaltung im Modul M8

Lehrveranstaltungsverantwortliche(r)	N.N. (Goethe Institut Schwäbisch Hall)
Semester	1 / 2
Häufigkeit des Angebots	Winter- und Sommersemester
Art der Veranstaltung	Sprachkurs
Lehrsprache	Englisch/ Deutsch
Leistungspunkte (ECTS)	5.0, dies entspricht einem Workload von 125 Stunden
SWS	4.0
Workload - Kontaktstunden	60
Workload - Selbststudium	65
Detailbemerkung zum Workload	
Prüfungsart	Lehrveranstaltungsbegleitend durch kombinierte Prüfung mit Klausur als abschließender Prüfung
Prüfungsdauer	90
Verpflichtung	Wahlmodul
Voraussetzungen für die Teilnahme	Deutschkenntnisse auf dem Niveau A1
Lehr-/Lernmethoden (Lehrformen)	
Fachkompetenz: Wissen und Verstehen	Mastery of all language skills (listening, reading, writing, speaking) at level A2
Fachkompetenz: Fertigkeit und Wissenserschließung	A2 German courses provides foundational language skills, focusing on basic communication in everyday situations. Students develop abilities in reading, writing, speaking, and understanding simple conversations on topics like shopping, travel, work, and hobbies. They learn to use simple sentences and expressions, ask and answer questions about familiar topics, and describe personal background, immediate needs, and routine tasks.
Personale Kompetenz: Sozialkompetenz	The students • take responsibility in a team. • work together with others in a goal-orientated manner. • achieve work results in groups and document them.
Personale Kompetenz: Selbständigkeit	The students • carry out a literature study on their own responsibility. • repeat and deepen the learning content independently.

Kompetenzniveau gemäß DQR	
Inhalte	Orientate themselves to an A2 textbook
Empfehlung für begleitende Veranstaltungen	
Sonstige Besonderheiten	
Literatur/Lernquellen	
Terminierung im Stundenplan	https://splan.hs-heilbronn.de/splan/
Leistungsnachweis bei kombinierter Prüfung	

HOCHSCHULE HEILBRONN

Veranstaltung M8.2 293622 Advised Studies 2

Diese Veranstaltung ist eine Wahlpflichtveranstaltung im Modul M8

Lehrveranstaltungsverantwortliche(r)	Prof. Dr.-Ing. Marcus Stolz
Semester	1 / 2
Häufigkeit des Angebots	Winter- und Sommersemester
Art der Veranstaltung	Vorlesung / Seminar
Lehrsprache	Abhängig von gewählten Veranstaltungen
Leistungspunkte (ECTS)	5.0, dies entspricht einem Workload von 125 Stunden
SWS	4.0
Workload - Kontaktstunden	Abhängig von gewählten Veranstaltungen
Workload - Selbststudium	Abhängig von gewählten Veranstaltungen
Detailbemerkung zum Workload	Selection of courses in the fields of Studium Generale (especially languages) or otherwise departments of TW, TP or IT. The students suggest a study agreement and discuss this with their representative study guide.
Prüfungsart	Lehrveranstaltungsbegleitend durch kombinierte Prüfung mit Klausur als abschließender Prüfung
Prüfungsdauer	90
Verpflichtung	Wahlmodul
Voraussetzungen für die Teilnahme	
Lehr-/Lernmethoden (Lehrformen)	• Creation / Modification of a learning agreement • Depending on chosen lectures
Fachkompetenz: Wissen und Verstehen	• Self-reflection • Identification of weaknesses
Fachkompetenz: Fertigkeit und Wissenserschließung	• Self-controlled learning
Personale Kompetenz: Sozialkompetenz	• Discussion about own weaknesses
Personale Kompetenz: Selbständigkeit	• Self-discipline • Time management

Kompetenzniveau gemäß DQR	6 / 7 (depending on defined topics)
Inhalte	• The student analyses his / her skills and identifies weaknesses which he / she wants to iron out by one of the following: • attending lectures of the Heilbronn University • attending online courses • working on literature • designing / implementing a personal project The phases of the course are: • identifying weaknesses • creating / modifying a learning agreement including milestones • several status reports during the semester • final report with a kind of proof of success (exam, running project, oral exam, presentation, ...)
Empfehlung für begleitende Veranstaltungen	
Sonstige Besonderheiten	
Literatur/Lernquellen	
Terminierung im Stundenplan	Appointments have to be arranged with the lector
Leistungsnachweis bei kombinierter Prüfung	

Modul M9 293630 Applied Research Studies

Dauer des Moduls	1 Semester
SWS	8.0
Prüfungsart	Modulnote (ohne Prüfung) setzt sich aus gewichteten Einzelleistungen zusammen
Prüfungsdauer	
Leistungspunkte (ECTS)	10.0
Voraussetzungen für die Vergabe von Leistungspunkten	
Modulverantwortliche(r)	Prof. Dr.-Ing. Marcus Stolz
Lehr-, Lern- und Prüfungsformen	
Lerninhalte	The module "Applied Research Studies" is designed to bridge theoretical with practical knowledge through a combination of a lecture series about entrepreneurship in R&D departments and a research project. Within the lecture series technical managers from cooperating companies discuss topics from their daily and strategic work with students. The students should learn that entrepreneurial thinking is crucial in development as well for personal as economic growth. The research project allows students to apply their knowledge and skills to real-world problems, engaging in original research that addresses specific challenges within their field of study. This involves formulating research questions, doing literature study and present their findings.
Fachkompetenz: Wissen und Verstehen (Lernziele)	The students • learn strategies and methods used in the industry to transform innovative ideas into marketable products or services. • develop of an entrepreneurial mindset that includes risk-taking, creativity, and problem-solving skills. • gain insights into the importance of networking and building relationships in the industry. • recognize real-world market trends and customer needs. • understand how to lead teams in innovative projects and manage diverse groups effectively. • apply their knowledge to real-world problems. • focus on individual research interests • formulate research questions • do literature study • learn how to present their findings
Fachkompetenz: Fertigkeit, Wissenserschließung	The students are able to • use experience from successful R&D professionals to improve their own skills. • apply methods, strategies and the entrepreneurial mindset in their professional work

	• communicate with stakeholders in order to get required resources for R&D projects • analyze company situations, market trends and research findings to an informed decision-making process. • apply the methods of project management. • plan a research endeavor. • draw up a schedule and an agreement on objectives in terms of content and deadlines. • do independent research work in assigned topics
Personale Kompetenz: Sozialkompetenz	The students • learn to interact with industry leaders and understand their mindset. • get used to present research topics in a larger group and take questions from a senior R&D leader. • assume responsibility in a team. • work together with others in a goal-orientated manner. • achieve work results in groups and document them. • deal with problems in the team with foresight.
Personale Kompetenz: Selbständigkeit	The students • organize their own work processes effectively. • work independently and on their own responsibility • take on sub-tasks of the working group members. • regularly discuss the actual and target comparisons in the progress of the project.
Kompetenzniveau gemäß DQR	7
Voraussetzungen für die Teilnahme	
Besonderheiten / Verwendbarkeit	
Terminierung im Stundenplan	
Leistungsnachweis bei kombinierter Prüfung	

Veranstaltung M9.1 293631 Entrepreneurship in R&D

Diese Veranstaltung ist Pflichtveranstaltung im Modul M9

Lehrveranstaltungsverantwortliche(r)	Prof. Dr.-Ing. Marcus Stolz
Semester	1
Häufigkeit des Angebots	Wintersemester
Art der Veranstaltung	Seminar/ Ringvorlesung
Lehrsprache	Englisch
Leistungspunkte (ECTS)	2.5
SWS	2.0, dies entspricht einem Workload von 62.5 Stunden
Workload - Kontaktstunden	30.0
Workload - Selbststudium	32.5
Detailbemerkung zum Workload	
Prüfungsart	lehrveranstaltungsbegleitend durch Referat
Prüfungsdauer	20 Min.
Verpflichtung	Pflichtmodul
Voraussetzungen für die Teilnahme	
Lehr-/Lernmethoden (Lehrformen)	Lecture series of R&D leaders and professionals • Follow-up of the lecture • Literature study • Preparing of presentation
Fachkompetenz: Wissen und Verstehen	The students • learn strategies and methods used in the industry to transform innovative ideas into marketable products or services. • develop of an entrepreneurial mindset that includes risk-taking, creativity, and problem-solving skills. • gain insights into the importance of networking and building relationships in the industry. • recognize real-world market trends and customer needs. • understand how to lead teams in innovative projects and manage diverse groups effectively.

Fachkompetenz: Fertigkeit und Wissenserschließung	The students are able to • use experience from successful R&D professionals to improve their own skills. • apply methods, strategies and the entrepreneurial mindset in their professional work • communicate with stakeholders in order to get required resources for R&D projects • analyze company situations, market trends and research findings to an informed decision-making process.
Personale Kompetenz: Sozialkompetenz	The students • learn to interact with industry leaders and understand their mindset. • get used to present research topics in a larger group and take questions from a senior R&D leader.
Personale Kompetenz: Selbständigkeit	The students • organize their own work processes effectively. • work independently and on their own responsibility.
Kompetenzniveau gemäß DQR	7
Inhalte	Lecture series of R&D leaders and professionals e.g. in the fields of • Product development • Market research • Funding and investment • Management of intellectual property • Technology transfer • Business models Case studies
Empfehlung für begleitende Veranstaltungen	
Sonstige Besonderheiten	
Literatur/Lernquellen	
Terminierung im Stundenplan	
Leistungsnachweis bei kombinierter Prüfung	

Veranstaltung M9.2 293632 Research Project

Diese Veranstaltung ist Pflichtveranstaltung im Modul M9

Lehrveranstaltungsverantwortliche(r)	Prof. Dr.-Ing. Martin Wäldele
Semester	1
Häufigkeit des Angebots	Wintersemester
Art der Veranstaltung	Labor
Lehrsprache	Englisch
Leistungspunkte (ECTS)	7.5, dies entspricht einem Workload von 187.5 Stunden
SWS	6.0
Workload - Kontaktstunden	None
Workload - Selbststudium	187.5
Detailbemerkung zum Workload	
Prüfungsart	lehrveranstaltungsbegleitend durch Laborarbeit
Prüfungsdauer	
Verpflichtung	Pflichtmodul
Voraussetzungen für die Teilnahme	
Lehr-/Lernmethoden (Lehrformen)	Group (2-4 students) research project under supervision and guidance of a professor. The project may be performed at a company, research lab or organization other than the university.
Fachkompetenz: Wissen und Verstehen	The students • apply their knowledge to real-world problems. • focus on individual research interests • formulate research questions • do literature study • learn how to present their findings
Fachkompetenz: Fertigkeit und Wissenserschließung	The students are able to • apply the methods of project management. • plan a research endeavor. • draw up a schedule and an agreement on objectives in terms of content and deadlines. • do independent research work in assigned topics

Personale Kompetenz: Sozialkompetenz	The students • assume responsibility in a team. • work together with others in a goal-orientated manner. • achieve work results in groups and document them. • deal with problems in the team with foresight.
Personale Kompetenz: Selbständigkeit	The students • organize their own work processes effectively. • work independently and on their own responsibility. • take on sub-tasks of the working group members. • regularly discuss the actual and target comparisons in the progress of the project.
Kompetenzniveau gemäß DQR	7
Inhalte	Research project addressing current problems in the program's field by the students in teamwork in cooperation with companies in the region or tasks from the university. • Self-organization of a working group of 2 to 4 students to work on an interdisciplinary research project. • Description of the research questions. • Joint target and deadline planning. • Assumption of subtasks by the working group members. • Regular project meetings with actual and target comparisons as the project progresses • Presentation of results in the form of written documentation.
Empfehlung für begleitende Veranstaltungen	
Sonstige Besonderheiten	
Literatur/Lernquellen	
Terminierung im Stundenplan	
Leistungsnachweis bei kombinierter Prüfung	

Modul M10 293640 Applied Development Studies

Dauer des Moduls	1 Semester
SWS	8.0
Prüfungsart	Modulnote (ohne Prüfung) setzt sich aus gewichteten Einzelleistungen zusammen
Leistungspunkte (ECTS)	
Voraussetzungen für die Vergabe von Leistungspunkten	10.0
Modulverantwortliche(r)	
Lehr-, Lern- und Prüfungsformen	Prof. Dr.-Ing. Marcus Stolz
Lerninhalte	The module "Applied Development Studies" is designed to bridge theoretical with practical knowledge through a combination of a lecture series about leadership in R&D departments and a development project. Within the lecture series technical managers from cooperating companies discuss topics from their daily and strategic work with students. The students should learn different approaches to leadership and the challenges they may face in industry. The development project allows students to apply their knowledge and skills to real-world problems, engaging in original research that addresses specific challenges within their field of study. This involves formulating system requirements, doing literature study, implement prototypes and present their results.
Fachkompetenz: Wissen und Verstehen (Lernziele)	The students • know and recognize different leadership styles • learning how to manage and lead through change, including how to implement new processes or technologies within R&D teams. • know how to create an environment that encourages creativity and innovation among team members. • apply their knowledge to real-world problems. • focus on individual interests • define requirements for the system • do literature study • select technologies and plan the system’s structure • implement and test the system
Fachkompetenz: Fertigkeit, Wissenserschließung	The students are able to • apply different leadership styles to inspire and motivate teams. • think strategically about R&D initiatives, aligning them with organizational goals and market demands. • achieve effective decision-making processes, including how to evaluate risks and opportunities • convey ideas clearly and effectively to diverse audiences. • build and maintain professional relationships with stakeholders, including cross-functional teams and external partners.

	• apply the methods of project management. • plan a development endeavor. • draw up a schedule and an agreement on objectives in terms of content and deadlines. • do independent development work in assigned topics • explore new technologies and tools
Personale Kompetenz: Sozialkompetenz	The students • learn to interact with industry leaders and understand their mindset. • get used to present research topics in a larger group and take questions from a senior R&D leader. • assume responsibility in a team. • work together with others in a goal-orientated manner. • achieve work results in groups and document them. • deal with problems in the team with foresight.

Personale Kompetenz: Selbständigkeit	The students • organize their own work processes effectively. • work independently and on their own responsibility. • take on sub-tasks of the working group members. • regularly discuss the actual and target comparisons in the progress of the project.
Kompetenzniveau gemäß DQR	7
Voraussetzungen für die Teilnahme	
Besonderheiten / Verwendbarkeit	
Terminierung im Stundenplan	
Leistungsnachweis bei kombinierter Prüfung	

Veranstaltung M10.1 293641 Leadership in R&D

Diese Veranstaltung ist Pflichtveranstaltung im Modul M10

Lehrveranstaltungsverantwortliche(r)	Prof. Dr.-Ing. Marcus Stolz
Semester	2
Häufigkeit des Angebots	Sommersemester
Art der Veranstaltung	Seminar/ Ringvorlesung
Lehrsprache	Englisch
Leistungspunkte (ECTS)	2.5
SWS	2.0, dies entspricht einem Workload von 62.5 Stunden
Workload - Kontaktstunden	30.0
Workload - Selbststudium	32.5
Detailbemerkung zum Workload	
Prüfungsart	lehrveranstaltungsbegleitend durch Referat
Prüfungsdauer	20 Min.
Verpflichtung	Pflichtmodul
Voraussetzungen für die Teilnahme	
Lehr-/Lernmethoden (Lehrformen)	Lecture series of R&D leaders and professionals • Follow-up of the lecture • Literature study Preparing of presentation
Fachkompetenz: Wissen und Verstehen	The students • know and recognize different leadership styles • learning how to manage and lead through change, including how to implement new processes or technologies within R&D teams. • know how to create an environment that encourages creativity and innovation among team members.

Fachkompetenz: Fertigkeit und Wissenserschließung	The students are able to • apply different leadership styles to inspire and motivate teams. • think strategically about R&D initiatives, aligning them with organizational goals and market demands. • achieve effective decision-making processes, including how to evaluate risks and opportunities • convey ideas clearly and effectively to diverse audiences. • build and maintain professional relationships with stakeholders, including cross-functional teams and external partners.
Personale Kompetenz: Sozialkompetenz	The students • learn to interact with industry leaders and understand their mindset. • get used to present research topics in a larger group and take questions from a senior R&D leader.
Personale Kompetenz: Selbständigkeit	The students • organize their own work processes effectively. • work independently and on their own responsibility.
Kompetenzniveau gemäß DQR	7
Inhalte	Lecture series of R&D leaders and professionals e.g. in the fields of • Leadership skills • Strategic thinking • Change management • Decision-making • Team building • Communication skills • Mentorship and coaching • Innovation-friendly environments • Project management • Networking and relationship management Case studies
Empfehlung für begleitende Veranstaltungen	
Sonstige Besonderheiten	
Literatur/Lernquellen	
Terminierung im Stundenplan	
Leistungsnachweis bei kombinierter Prüfung	

Veranstaltung M10.2 293642 Development Project

Diese Veranstaltung ist Pflichtveranstaltung im Modul M10

Lehrveranstaltungsverantwortliche(r)	Prof. Dr.-Ing. Martin Wäldele
Semester	2
Häufigkeit des Angebots	Sommersemester
Art der Veranstaltung	Labor
Lehrsprache	Englisch
Leistungspunkte (ECTS)	7.5, dies entspricht einem Workload von 187.5 Stunden
SWS	6.0
Workload - Kontaktstunden	None
Workload - Selbststudium	187.5
Detailbemerkung zum Workload	
Prüfungsart	lehrveranstaltungsbegleitend durch Laborarbeit
Prüfungsdauer	
Verpflichtung	Pflichtmodul
Voraussetzungen für die Teilnahme	
Lehr-/Lernmethoden (Lehrformen)	Group (2-4 students) development project under supervision and guidance of a professor. The project may be performed at a company, research lab or organization other than the university.
Fachkompetenz: Wissen und Verstehen	The students • apply their knowledge to real-world problems. • focus on individual interests • define requirements for the system • do literature study • select technologies and plan the system’s structure • implement and test the system
Fachkompetenz: Fertigkeit und Wissenserschließung	The students are able to • apply the methods of project management. • plan a development endeavor. • draw up a schedule and an agreement on objectives in terms of content and deadlines. • do independent development work in assigned topics • explore new technologies and tools

Personale Kompetenz: Sozialkompetenz	The students • assume responsibility in a team. • work together with others in a goal-orientated manner. • achieve work results in groups and document them. • deal with problems in the team with foresight.
Personale Kompetenz: Selbständigkeit	The students • organize their own work processes effectively. • work independently and on their own responsibility. • take on sub-tasks of the working group members. • regularly discuss the actual and target comparisons in the progress of the project.
Kompetenzniveau gemäß DQR	7
Inhalte	Development project addressing current problems in the program's field by the students in teamwork in cooperation with companies in the region or tasks from the university. The goal is to build a prototype system (product or program). • Self-organization of a working group of 2 to 4 students to work on an interdisciplinary research project. • Description of the research questions. • Joint target and deadline planning. • Assumption of subtasks by the working group members. • Regular project meetings with actual and target comparisons as the project progresses • Development of prototype • Presentation of results in the form of written documentation.
Empfehlung für begleitende Veranstaltungen	
Sonstige Besonderheiten	
Literatur/Lernquellen	
Terminierung im Stundenplan	
Leistungsnachweis bei kombinierter Prüfung	

Modul M11 293650 Master-Thesis

Dauer des Moduls	1 Semester
SWS	
Prüfungsart	Modulnote (ohne Prüfung) setzt sich aus gewichteten Einzelleistungen zusammen
Prüfungsdauer	
Leistungspunkte (ECTS)	30.0
Voraussetzungen für die Vergabe von Leistungspunkten	
Modulverantwortliche(r)	Prof. Dr.-Ing. Martin Wäldele
Lehr-, Lern- und Prüfungsformen	
Lerninhalte	
Fachkompetenz: Wissen und Verstehen (Lernziele)	The students demonstrate that they are able to solve a task from the subject independently within a time given in theory and practice using scientific methods. The Master's thesis is an examination paper for which a processing time of six months is available. Students' independent study is encouraged and monitored through counselling sessions.
Fachkompetenz: Fertigkeit, Wissenserschließung	
Personale Kompetenz: Sozialkompetenz	Based on scientific methods, students contribute to solving a problem and provide a clearly structured description of their results that can be understood by experts in their field. The students organize their own work processes effectively and work independently and on their own responsibility.
Personale Kompetenz: Selbständigkeit	Students are required to develop and understanding of a problem area in a limited amount of time. The research and writing requires students to work independently using only sources that have to be listed in the thesis document. The students • organize their own work processes effectively. • work independently and on their own responsibility. • take on sub-tasks of the working group members. regularly discuss the actual and target comparisons in the progress of the project.
Kompetenzniveau gemäß DQR	7

Voraussetzungen für die Teilnahme	The topic of the Master's thesis must be issued at the earliest after the examination period of the 2nd semester and at the latest

	6 months after the end of the semester in which the last subject examination was successfully completed.
Besonderheiten / Verwendbarkeit	
Terminierung im Stundenplan	
Leistungsnachweis bei kombinierter Prüfung	

HOCHSCHULE HEILBRONN

Veranstaltung M11.1 293651 Master Thesis

Diese Veranstaltung ist Pflichtveranstaltung im Modul M11

Lehrveranstaltungsverantwortliche(r)	Prof. Dr. Martin Wäldele
Semester	3
Häufigkeit des Angebots	Winter- und Sommersemester
Art der Veranstaltung	Abschlussarbeit
Lehrsprache	Englisch
Leistungspunkte (ECTS)	28.0, dies entspricht einem Workload von 700 Stunden
SWS	
Workload - Kontaktstunden	None
Workload - Selbststudium	625.0
Detailbemerkung zum Workload	
Prüfungsart	Abschlussarbeit (Master-Thesis)
Prüfungsdauer	
Verpflichtung	
Voraussetzungen für die Teilnahme	
Lehr-/Lernmethoden (Lehrformen)	Written thesis under supervision and guidance of a professor and a secondary supervisor. The thesis describes the students practical research on a clearly defined and agreed upon topic in a limited time frame. Optionally, the research may be performed at a company, research lab or organization other than the university.
Fachkompetenz: Wissen und Verstehen	Students demonstrate the ability to • apply the knowledge and skills gained during their studies to a specific research problem. • develop a deeper understanding of a problem area and the work that has been done in that area. • weigh alternative approaches to solving a problem and making informed decisions. • produce concrete results given a research question by applying scientific methods. • write a well-structured document describing their theoretical, practical or experimental research and results.

Fachkompetenz: Fertigkeit und Wissenserschließung	

Personale Kompetenz: Sozialkompetenz	Based on scientific methods, students contribute to solving a problem and provide a clearly structured description of their results that can be understood by experts in their field.
Personale Kompetenz: Selbständigkeit	Students are required to develop and understanding of a problem area in a limited amount of time. The research and writing requires students to work independently using only sources that have to be listed in the thesis document.
Kompetenzniveau gemäß DQR	7
Inhalte	Research on a specific topic that relates to the study program. Application of scientific methods to produce results. Writing of thesis document.
Empfehlung für begleitende Veranstaltungen	
Sonstige Besonderheiten	
Literatur/Lernquellen	
Terminierung im Stundenplan	
Leistungsnachweis bei kombinierter Prüfung	

Veranstaltung M11.2 293652 Master Thesis Colloquium

Diese Veranstaltung ist Pflichtveranstaltung im Modul M11

Lehrveranstaltungsverantwortliche(r)	Prof. Dr. Martin Wäldele
Semester	3
Häufigkeit des Angebots	Winter- und Sommersemester
Art der Veranstaltung	Abschlussarbeit (mündliche Prüfung)
Lehrsprache	Englisch
Leistungspunkte (ECTS)	2.0, dies entspricht einem Workload von 50 Stunden
SWS	
Workload - Kontaktstunden	None
Workload - Selbststudium	50 hours
Detailbemerkung zum Workload	
Prüfungsart	Lehrveranstaltungsübergreifend durch mündliche Prüfung
Prüfungsdauer	30 Minuten, durchgeführt von 2 Prüfenden
Verpflichtung	Pflichtmodul
Voraussetzungen für die Teilnahme	
Lehr-/Lernmethoden (Lehrformen)	The students can register for the oral Master's examination in the third semester. The subject of this examination is the topic of the Master's thesis.
Fachkompetenz: Wissen und Verstehen	Students demonstrate that they recognize the interrelationships of the examination area and are able to categorize specific questions in these contexts. In doing so, they demonstrate the ability to think abstractly and analytically.
Fachkompetenz: Fertigkeit und Wissenserschließung	The students are able to • present the results of the Master's thesis in a comprehensive presentation. • recognize the interrelationships of the examination area. • categorize specific questions in these contexts. • demonstrate the ability to think abstractly and analytically.

Personale Kompetenz: Sozialkompetenz	The students • organize their own work processes effectively. • work independently and on their own responsibility.

Personale Kompetenz: Selbständigkeit	The students • organize their own work processes effectively. • work independently and on their own responsibility. • take on sub-tasks of the working group members. • regularly discuss the actual and target comparisons in the progress of the project.
Kompetenzniveau gemäß DQR	7
Inhalte	
Empfehlung für begleitende Veranstaltungen	
Sonstige Besonderheiten	
Literatur/Lernquellen	
Terminierung im Stundenplan	
Leistungsnachweis bei kombinierter Prüfung	