Study regulations of the
FH Master's course

Smart Products & Solutions

To obtain the academic degree

Master of Science in Engineering
abbreviated to MSc

as an appendix to the statutes of the FH Kufstein Tirol

Organizational form
Duration: 4 semesters
Scope: 120 ECTS
Places for beginners per academic year: 30 part-time

Version 1
Decided by the FH Faculty Council on October 07, 2020

Content

With the amendment to the University Act 2020, the so-called "University of Applied Sciences Studies Act (FHStG)" has been renamed "University of Applied Sciences Act (FHG)". Accordingly, a necessary editorial adjustment was made in this document on January 13th, 2021 and the name FHStG was replaced by FHG.

1 OCCUPATIONAL PROFILES

1.1 Occupational fields

Graduates of the Master's course in Smart Products & Solutions can, thanks to their general technical and economic education, work in all industries that deal with smart products and solutions based on them.

However, employees and managers are particularly in demand in the following core industries:
- Mechanical and plant engineering
- Equipment manufacturers
- Vehicle manufacturer
- Energy industry
- Logistics, transport
- Management consultancy

The classification into industries is complicated by the profitable fact that, due to technological change, smart products and related solutions are increasingly relevant to all companies. As a result, graduates can enter a wide range of different types of companies: This means that large companies and small and medium-sized enterprises are looking for qualified graduates from the technical/engineering field. It should also be noted here that the design of the curriculum also gives graduates the option of starting a business.

Based on the training objective of a generalist, the possible occupational profiles are very broadly diversified. Essential characteristics of the vocational fields of activity are thereby:
- Work on technically-oriented activities at the interface between technology and business
- The management fields in which the graduates can apply their skills. These can be used in the scope of a freelance activity as well as within a company structure at the middle or upper management level.

Following an induction phase, graduates of this course of studies are able to take on leading positions. Below some typical positions are listed as examples:

Technical Project Management

Technical project management is a functional description that can apply to leading functions in all technical areas. Project managers have extensive decision-making authority for their respective areas of responsibility.
Specific tasks are:
- Interface between customers/specialist managers and developers
- Writing requirement specifications and technical documentation
- Contract management and opportunity and risk management
- Project coordination and communication
- Project-specific monitoring and reporting
- Coordination and management of the internal project team
- Representation of projects to superiors and customers

Product management

The management of products is a multifaceted task and requires not only an understanding of the market and customers, but above all an understanding of the underlying issues. This enables the "technically feasible" to be compared with the "desired by the customer".
Specific tasks are:
- Monitoring and evaluation of market trends
- Tracking evaluation of customer trends
- Definition of product requirements/supplements
- Creation of requirement specifications and technical documentation

- Accompanying the development and ensuring the required properties
- Designing the market launch

Digital Transformation Manager

The tasks of managers of digital transformation are manifold and, due to the short period of establishment in companies, only in the design stage. In general, it can be said that those responsible have a transformative role, i.e. they are responsible for the digital scope of the business. At the same time, they also have the task of further developing the company's organization with regard to the requirements of digitization.

Specific tasks are:

- Development of a digitization strategy
- Derivation of organizational structures and processes
- Monitoring implementation at different levels
- Initiating and accompanying process changes
- Accompaniment of the organizational development
- Providing input for digital innovations

Innovation and Technology Management

The core area is the understanding and evaluation of technology, architectures and business models in the context of the company, such as corporate and product strategy, positioning, market and competitive dynamics, etc.

Specific tasks are:

- Monitoring and evaluation of trends
- Monitoring and evaluation and development of technologies
- Brainstorming and concept development
- Construction of early prototypes for validation
- Consultation of internal departments
- Preparation of analyses, specifications/concepts
- Studies and analyses of the current situation and environment
- Presentation of concepts and solutions

Technical Consulting

Technical consultants advise mainly industrial and commercial enterprises on technical innovations, potential applications and advantages of certain technical solutions. They develop technical concepts for their clients and monitor their implementation.

Specific tasks are:

- Advice
- Acquisition and implementation of consulting projects
- Technical analysis and implementation tasks
- Definition of offers
- Development of product strategies and feasibility studies
- Conception, introduction of previously-conceived requirements and technical documentation
- Requirement analyses
- Technical specifications
- Technical assistance in various parts of the value chain

Further professional fields include:

Product Development
Founders
Research in the field of smart products and solutions

1.2 Qualification profile

The qualification aims and learning outcomes of the Bachelor degree programSmart Products & Solutions *Industrial Engineering and Management* correspond both to the academic and vocational requirements and to the *ISCED level 0788*[1] International Standard (Classification of Education). The contents taught qualify the graduates for the specified professional fields of activity.

Occupational field of activity	Task	Competence description	Competence allocation	Curriculum/modules
Technical Project Manager	Drafting of product specifications/requirements Setting up projects (goals, team, plan)	May impose requirements Can create specifications Can plan and monitor projects	Professional-academic	Product development Product management
	Coordinating project team Communicating with stakeholders	Can deal with resistance Can communicate with customers	Personal/social	Social Skills
Product management	Tracking market/customer trends Defining product requirements Creating requirement specifications	Can analyze trends Can identify and prioritize product requirements Can create specifications	Professional-academic	Product management
	Communicating with internal/external stakeholders	Can coordinate the internal departments involved Can represent product	Personal/social	Social Skills
Manager Digital Transformation	Monitoring technological trends Development of digitization strategies Recognition of digitization potential Monitoring, coordination, leverage of the digitization project portfolio Support in implementing new solutions	Knows current technological trends Can derive a digitization strategy from the divisional strategy Can identify potential for digitization Can monitor project portfolios	Technical and scientific	Digital transformation

[1] Example 4: A program consisting of 40% engineering (071), 30% business (041) and 30% languages (023) should be classified as 0788 (“Inter-disciplinary programs and qualifications involving engineering, manufacturing and construction”) as no field predominates but 07 is the leading broad field. If engineering and business were equally important and greater than languages (e.g. 40%, 40% and 20%), the program would be classified as either 0788 or 0488 depending on which program, engineering (071) or business (041), is listed first in the program title (or, if not in the title, in the curriculum or syllabus).

	Initiating, communicating, convincing digitization projects and solutions	Can inspire people for new projects	Personal/social	Social Skills
Product Developer	Developing smart products Translating requirements into technical specifications Selecting system architecture Simulation and development of prototypes Preparation of feasibility studies	Knows technical solutions in the field of sensor technology, data transmission, actuators, embedded systems Can IOT evaluate and select architectures Can create product designs Can create and test prototypes	Professional-academic	Data management Product development
	Presentation of concepts	Can present convincingly	Personal/social	Social Skills
Technical Consultant	Advice on selecting technical solutions Developing product strategies and feasibility studies Conception of solutions Creation of technical documentation	Knows technical solutions in the field of smart products Can create concepts from requirements Can define product strategies Can evaluate the quality and risks of solutions Can produce technical documentation	Professional-academic	Digital transformation Product development Data management Product management

2 CURRICULUM

2.1 Curriculum Data

	PT	Comment if applicable
First year of study (YYY/YY$_{+1}$)	2021/2022	
Standard duration of study (number of semesters)	4	
Obligatory WSH (Total number for all sem.)	53	
Course weeks per semester (number of weeks)	15	
Obligatory course hours (Total for all sem.)	825	
Obligatory ECTS (Total for all sem.)	120	
WS start (Date, comm.: poss. CW)	CW 40	
WS end (Date, comm.: poss. CW)	CW 5	
SS start (Date, comm.: poss. CW)	CW 11	
SS end (Date, comm.: poss. CW)	CW 28	
WS weeks	15	
SS weeks	15	
Obligatory semester abroad (semester specification)	No	
Language of instruction (specify)	German	The proportion of English-language courses amounts to% of the WSH
Internship (semester information, duration in weeks per semester)	No	

Resulting from the merging of the degree programs or from the separation from the degree program (StgKz; to be specified only for merging or separation)	

2.2 Curriculummatrix

Module assignment overview

Module	Module Title	Course title	WSH	ECTS	Sem.
DAT	Data management	Data Analytics & Visualization	3	6	3
		Data transmission	3	6	2
		Software Architecture & Programming	3	6	1
DIT	Digital Transformation	Privacy & Ethics	1.5	3	4
		Digital Transformation (E)	2	3	1
		Strategy & Business Model	1.5	3	1
MA	Master thesis	Colloquium for the Master thesis	1	2	4
		Master thesis	0	22	4
		Academic Methods	1	2	3
PDE	Product development	Advanced Prototyping (E)	2	3	2
		Embedded systems	3	4	1
		Interaction design & product design	3	6	2
		Mechatronic systems	3	6	2
		Requirements Engineering	1.5	3	1
		Sensors & Actuators	3	4	1
		System Modelling & Simulation (E)	2	4	1
PRM	Product management	Product Quality & Risk Management (E)	2	5	3
		Product management	2	3	1
PXT	Practical Transfer	Practical Project	2	4	3
		Study trip (E)	2	3	2
SSK	Social Skills	Change Management	1.5	3	2
		Project Management (E)	2	3	2
		Value Selling & Communication	2	5	3
WPF	Elective subject	Agile Product Development (elective)	2	4	3
		Application-oriented Analysis Platforms (elective)	2	4	3
		Business Platforms & Cloud Computing (elective)	2	4	3
		Data Visualization & Visual Analytics (elective)	2	4	3
		Internet of Things (elective)	2	4	3
		Human-Computer Interaction (elective)	2	4	3
		Process Automation (elective)	2	4	3
		Quantitative Process and Quality Management (Six Sigma) (elective)	2	4	3
		Trends in Data Science (elective)	2	3	4
		Trends in ERP (elective)	2	3	4
		Trends in Smart Products(elective)	2	3	4
		Trends in Web Technologies(elective)	2	3	4
			53.0	**120**	

In the following curriculum matrix, some courses are offered as elective courses together with the "Web Communication & Information Systems", "ERP Systems & Business Process Management" and "Data Science & Intelligent Analytics" Master's courses. In the third semester, students select 1 course from a bundle of 4 non-technical courses and 1 course from a bundle of 4 technical courses. In the fourth semester, they select a course from a bundle of 4 courses. The following courses are included:

Non-technical elective courses in the third semester (1 out of 4):

- Agile Product Development
- Data Visualization & Visual Analytics
- Human-computer Interaction
- Quantitative Process and Quality Management (Six Sigma)

Technical elective courses in the third semester (1 out of 4):

- Application-oriented Analysis Platforms
- Business Platforms & Cloud Computing
- Internet of Things
- Process Automation

Elective courses in the fourth semester (1 out of 4):

- Trends in Data Science
- Trends in ERP
- Trends in Smart Products
- Trends in Web Technologies

1st semester

Course no.	Course title	Course type	T	E	eLV	WSH	No. of groups	AWSH	ALVS	MODULE	ECTS
DAT.1	Software Architecture & Programming	ILV	X		30%	3	1	3	45	DAT	6
DIT.1	Digital Transformation (E)	ILV		X	15%	2	1	2	30	DIT	3
DIT.2	Strategy & Business Model	ILV			15%	1.5	1	1.5	22.5	DIT	3
PDE.1	Requirements Engineering	ILV			15%	1.5	1	1.5	22.5	PDE	3
PDE.3	Sensors & Actuators	ILV	X		15%	3	1	3	45	PDE	4
PDE.4	Embedded Systems	ILV	X		30%	3	1	3	45	PDE	4
PDE.5	System Modelling & Simulation (E)	ILV	X	X	70%	2	1	2	30	PDE	4
PRM.1	Product management	ILV			15%	2	1	2	30	PRM	3
Total line:						18.0		18.0	270.0		30
Course hours = Total WSH x course weeks						270.0					

2nd semester

Course no.	Course title	Course type	T	E	eLV	WSH	No. of groups	AWSH	ALVS	MODULE	ECTS
DAT.2	Data Transmission	ILV	X		30%	3	1	3	45	DAT	6
PDE.2	Mechatronic Systems	ILV	X		25%	3	1	3	45	PDE	6
PDE.6	Interaction Design & Product Design	ILV			20%	3	1	3	45	PDE	6
PDE.7	Advanced Prototyping (E)	ILV	X	X	15%	2	1	2	30	PDE	3
PXT.1	Study trip (E)	ILV	X	X	0%	2	1	2	30	PXT	3
SSK.1	Project Management (E)	ILV		X	20%	2	1	2	30	SSK	3
SSK.2	Change Management	ILV			15%	1.5	1	1.5	22.5	SSK	3
Total line:						16.5		16.5	247.5		30
Course hours = Total WSH x course weeks						247.5					

3rd semester

Course no.	Course title	Course type	T	E	eLV	WSH	No. of groups	AWSH	ALVS	MODULE	ECTS
DAT.3	Data Analytics & Visualization	ILV	X		30%	3	1	3	45	DAT	6
MA.1	Academic Methods	SE			50%	1	1	1	15	MA	2
PRM.2	Product Quality & Risk Management (E)	ILV	X	X	15%	2	1	2	30	PRM	5
PXT.2	Practical Project	PT	X		30%	2	2	4	60	PXT	4
SSK.3	Value Selling & Communication	ILV			15%	2	1	2	30	SSK	5
WPF.1	Quantitative Process and Quality Management (Six Sigma) (elective)	ILV			15%	2	1	2	30	WPF	4
WPF.2	Application-oriented Analysis Platforms (elective)	ILV	X		15%	2	1	2	30	WPF	4
WPF.3	Internet of Things (elective)	ILV	X		15%	2	1	2	30	WPF	4
WPF.4	Business Platforms & Cloud Computing (elective)	ILV	X		15%	2	1	2	30	WPF	4
WPF.5	Process Automation (elective)	ILV	X		15%	2	1	2	30	WPF	4
WPF.6	Data Visualization & Visual Analytics (elective)	ILV			15%	2	1	2	30	WPF	4
WPF.7	Agile Product Development (elective)	ILV			15%	2	1	2	30	WPF	4
WPF.8	Human-Computer Interaction (elective)	ILV			15%	2	1	2	30	WPF	4
Total line:						14		16	240		30
Course hours = Total WSH x course weeks						210					

The following description of the courses does not include the work involved in supervising Master theses. 0.6 weekly semester hours are planned per supervised thesis, i.e. for 30 students an additional 18 thesis weekly semester hours, which are incurred in the 4th semester. In total, an AWSH sum of 73 AWSH is achieved over all 4 semesters.

4th semester

Course no.	Course title	Course type	T	E	eLV	WSH	No. of groups	AWSH	ALVS	MODULE	ECTS
DIT.3	Privacy & Ethics	ILV			15%	1.5	1	1.5	22.5	DIT	3
MA.2	Colloquium for the Master thesis	SE			50%	1	1	1	15	MA	2
MA.3	Master thesis	UE			0%	0	1	0	0	MA	22*
WPF.10	Trends in Data Science (elective)	ILV			0%	2	1	2	30	WPF	3
WPF.11	Trends in Smart Products (elective)	ILV			0%	2	1	2	30	WPF	3
WPF.12	Trends in Web Technologies(elective)	ILV			0%	2	1	2	30	WPF	3
WPF.9	Trends in ERP (elective)	ILV			0%	2	1	2	30	WPF	3
Total line:						4.5		4.5	67.5		30
Course hours = Total WSH x course weeks						67.5					

* The 22 ECTS for the Master thesis are divided into 20 ECTS for the Master thesis and 2 ECTS for the final examination.

The "Trends" course is offered together with the "Web Communication & Information Systems", "Digital Science & Intelligence Analysis" and "ERP-Systems & Business Process Management" Master's courses as an elective course. Students select 1 Trends course, which they then complete as a compulsory subject.

Abbreviations	
eLV	E-learning proportion of course in percent
E	Lecture in English language
ECTS	ECTS – Credit points
LV	Course
LVS	Course hour(s)
WSH	Weekly semester hour(s)
T	Lecture with technical background
WP	Elective subject

Summary of curriculum data

Description	WSH	AWSH	ALVS	ECTS
Total number of courses over all semesters	53	55	825	120
Total number of courses in 1st year of study	34.5	34.5	517.5	60
Total number of courses in 2nd year of study	18.5	20.5	307.5	60
Total number of courses in 3rd year of study				
Total number of technical events over all semesters	30			55
Percentage of technical courses over all semesters based on WSH / ECTS	56.6%			45.83%
Total number of courses in English over all semesters	12			21
Proportion of courses in English over all semesters based on WSH / ECTS	22.64%			17.5%
Proportion of eLearning units over all semesters based on WSH / ECTS	22.26%			18.63%

2.3 Module descriptions

Module number:	**Product development**	**Scope:**	
PDE		**30**	**ECTS**
Degree program	University of Applied Sciences Master's course - Smart Products & Solutions Part-time		
Position in the curriculum	1st semester		
	2nd semester		
Level	1st semester: second cycle, Master / 1st semester: second cycle, Master / 2nd semester: second cycle, Master		
Previous knowledge	1st semester: according to admission requirements / 1st semester: according to admission requirements / 1st semester: according to admission requirements / 2nd semester: none		
Blocked	no		
Participant group	Bachelor graduates, beginners		
Literature recommendation	Requirements Engineering /ILV / Course no.: PDE.1 / 1st semester / ECTS: 3 Ebert Ch.; Systematisches Requirements Engineering: Anforderungen ermitteln, dokumentieren, analysieren und verwalten; Heidelberg, 2019 Rupp C. et al.: Requirements-Engineering und –Management, Carl Hanser Verlag, 2014 Hammerschall U., Beneken G.: Requirements Engineering, Pearson Studium, 2013 Pohl K., Rupp C.: Basiswissen Requirements Engineering, dpunkt Verlag, 2015		
	Mechatronic Systems /ILV / Course no.: PDE.2 / 2nd semester / ECTS: 6 Berger M.; Grundkurs der Regelungstechnik, Books on Demand GmbH; 2001 Czichos H.; Mechatronik: Grundlagen und Anwendungen technischer Systeme; Wiesbaden; 2019, 4th edition Isermann R.; Mechatronische Systeme; Berlin; 2007, 2nd edition		
	Sensors & Actuators /ILV / Course no.: PDE.3 / 1st semester / ECTS: 4 Czichos H.; Mechatronik: Grundlagen und Anwendungen technischer Syste- me; Wiesbaden; 2019, 4th edition Heinrich B., Linke P., Glöckler M.; Grundlagen Automatisierung: Sensorik, Regelung, Steuerung; Wiesbaden; 2017, 2nd edition Tränkler H., Reindl L.; Sensortechnik: Handbuch für Praxis und Wissenschaft; Berlin; 2018, 2nd edition		
	Embedded Systems /ILV / Course no.: PDE.4 / 1st semester / ECTS: 4 Berns K., Schürmann B., Trapp M.; Eingebettete Systeme: Systemgrundlagen und Entwicklung eingebetteter Software; Wiesbaden; 2010 Eisenlöffl Th.; Embedded-Software entwickeln: Grundlagen der Programmie- rung eingebetteter Systeme - Eine Einführung für Anwendungsentwickler; Heidelberg; 2012 Bringmann O., Lange W., Bodgan M.; Eingebettete Systeme: Entwurf, Modellierung und Synthese; Berlin; 2018 Wüst K.; Mikroprozessortechnik: Grundlagen, Architekturen, Schaltungs- technik und Betrieb von Mikroprozessoren und Mikrocontrollern; Wiesbaden; 2011		
	System Modelling & Simulation (E) /ILV / Course no.: PDE.5 / 1st semester / ECTS: 4 Fei T., Meng Zh., Nee A.Y.C; Digital Twin Driven Smart Manufacturing; 2019 Lughofer E., Sayed-Mouchaweh M.; Predictive Maintenance in Dynamic Systems; 2019 Glöckler M.; Simulation mechatronischer Systeme: Grundlagen und technische Anwendung; Heidleberg; 2017 Nollau R.; Modellierung und Simulation technischer Systeme: Eine praxisnahe Einführung; Heidelberg; 2009		
	Interaction Design & Product Design /ILV / Course no.: PDE.6 / 2nd semester / ECTS: 6 Gerhard H., Lanz M., Prettenthaler M.; Design Basics: von der Idee zum Produkt; 2018 Follet J.; Designing for Emerging Technologies: UX for Genomics, Robotics, and the Internet of Things; 2014 Steane J.; The Principles and Processes of Interactive Design; London, 2018		
	Advanced Prototyping (E) /ILV / Course no.: PDE.7 / 2nd semester / ECTS: 3 Bryden D.; CAD and Rapid Prototyping for Product Design; London; 2014 Gebhardt A.; Additive Fertigungsverfahren : Additive Manufacturing und 3D-Drucken für Prototyping - Tooling – Produktion; München; 2016 Runco M. A.; Creativity : Theories and Themes: Research, Development, and Practice; Amsterdam; 2007		
Skills acquisition	Requirements Engineering /ILV / Course no.: PDE.1 / 1st semester / ECTS: 3		

	The graduate, the student: * Knows the importance of requirements engineering for project success * Knows different types of requirements (functional, non-functional) * Can absorb requirements from business * Knows the process of requirements engineering * Knows methods for collecting customer requirements (including questionnaires, interviews) * Can document customer and business requirements for products and solutions (natural language and model based) * Can evaluate requirements * Knows methods for validating requirements * Can manage the implementation of requirements * Is familiar with IT tools for supporting requirements engineering
	Mechatronic Systems/ILV / Course no.: PDE.2 / 2nd semester / ECTS: 6 The students: * understand the structure of mechatronic systems and their description methods * understand the principles and structure of a closed-loop and open-loop control system * can interpret a mechatronic system * can model and simulate mechatronic systems with Matlab

Skills acquisition	Sensors & Actuators /ILV / Course no.: PDE.3 / 1st semester / ECTS: 4 The graduate / the student: * knows the process chain between sensors and actuators * can characterize the wide range of sensors * can formulate advantages and disadvantages of different sensors for a given application and select sensors suitable for the application * acquires the ability to describe the structure of sensors, interpret data sheets and carry out measurements * can interpret measurement results and know their formats in order to optimize further data processing
	Embedded Systems /ILV / Course no.: PDE.4 / 1st semester / ECTS: 4 The graduate / the student: * knows the architecture and components of embedded systems and can justify the advantages and disadvantages of different designs * knows the development process and tools * can define the requirements for an embedded system, evaluate concepts and make a selection * is able to set up the development environment for an embedded system * is able to create and implement simple programs regarding control, processing of sensor data, control of actuators and communication
	System Modelling & Simulation (E) /ILV / Course no.: PDE.5 / 1st semester / ECTS: 4 The graduate / the student: * understands the basics of modelling and can apply them * knows typical applications and advantages of simulation * knows simulation areas and simulation software for smart products and solutions * can create models and simulation sequences * can interpret simulation results * can define a smart communicating product * is familiar with the concepts of digital twin, condition monitoring, predictive maintenance
	Interaction Design & Product Design /ILV / Course no.: PDE.6 / 2nd semester / ECTS: 6 The graduate / the student: * can explain design guidelines and contexts for interaction design and product design * can develop concepts based on requirements and evaluate them * can independently carry out an industrial design project and an interaction design project * can use the necessary tools correctly
	Advanced Prototyping (E) /ILV / Course no.: PDE.7 / 2nd semester / ECTS: 3 The graduate / the student: * knows common prototyping technologies * can apply them fundamentally * can create a simple digital model
Course contents	Requirements Engineering /ILV / Course no.: PDE.1 / 1st semester / ECTS: 3 * Benefits of requirements engineering * Basic terms of requirements engineering * Types of requirements * Requirements engineering process * System analysis in requirements engineering * Techniques for determining requirements * Natural language documentation of requirements * Model-based documentation of requirements * Evaluation of requirements * Quality criteria for requirements * Testing of requirements * Administration of requirements * Tool support
	Mechatronic Systems /ILV / Course no.: PDE.2 / 2nd semester / ECTS: 6

	* Introduction to mechatronics * Technical systems (function, structure, properties) * Laplace transformation * Modelling of mechatronic systems in the time and image domain * Bode diagrams and locus curves * Representative control elements * Calculating with block diagrams * Description of mechatronic systems and control loops in Matlab and Simulink * Principles, structure and properties of closed-loop and open-loop control
	Sensors & Actuators /ILV / Course no.: PDE.3 / 1st semester / ECTS: 4 * Definition/classification of sensors * Structure and function of a measuring chain * Fields of application and functional principles of sensors * Basics of microsensors * Sensor properties (static and dynamic behavior, reliability, etc.) * Measurement errors and sources of error

Course contents	* Calibration * Signal transmission/processing * Basic terms of relevant measurement technology * Application of sensors for different areas (e.g. temperature, weight, pressure, acceleration, position, etc.) * Analysis and evaluation of functional principles and sensor properties * Structure and properties of data transmission and data processing in a measurement chain * Evaluation, interpretation and storage of measurements
	Embedded Systems /ILV / Course no.: PDE.4 / 1st semester / ECTS: 4 • System solutions and architecture of embedded systems and characteristics • Embedded hardware (processors, memory, I/O, busses) • Embedded software (operating system, middleware, application, drivers) • Real-time operation (classification, implementation) • Multi-processor operation • Getting to know simple platforms (e.g. Raspberry Pi, Arduino, FPGA) and the development environment • Implementing simple use cases concerning the processing of sensors and the control of actuators • Implementing different possibilities of data transmission • Realization of a more complex final project
	System Modelling & Simulation (E) /ILV / Course no.: PDE.5 / 1st semester / ECTS: 4 * Introduction (fields of application, goals, uses, concept) * Definitions (Digital Model, Digital Shadow, Digital Twin) * Models and model building * Building models * Theoretical principles of simulation * Practical implementation of simulation * Implementation of the concept of digital twin with
	Interaction Design & Product Design /ILV / Course no.: PDE.6 / 2nd semester / ECTS: 6 * Definition/delimitation of interaction design and product design * Classification in the product development process * Procedure, approaches/principles and tools for interaction design * Procedure, approaches/principles and tools for product design * Evaluation criteria and the evaluation of developed or existing concepts
	Advanced Prototyping (E) /ILV / Course no.: PDE.7 / 2nd semester / ECTS: 3 Prototyping Technologies * Laser engravers (Lasercut) * Additive manufacturing methods (e.g. 3D printing) * Abrasive manufacturing methods (e.g. PCB milling) * Digital prototypes (e.g. Click Dummies for Apps) * Scan technologies * Basics of CAx * Virtual prototyping Protoyping Concepts * Design thinking * Creativity methods (e.g. Morphological Box, Creative Problem Solving, TRIZ) Creating a Prototype
Teaching and learning methods	Requirements Engineering /ILV / Course no.: PDE.1 / 1st semester / ECTS: 3 Lecture, group work, presentation and discussion of tasks
	Mechatronic Systems /ILV / Course no.: PDE.2 / 2nd semester / ECTS: 6 Lecture, individual work with software, group work, presentation and discussion of tasks
	Sensors & Actuators /ILV / Course no.: PDE.3 / 1st semester / ECTS: 4 Lecture, group work, presentation and discussion of tasks
	Embedded Systems /ILV / Course no.: PDE.4 / 1st semester / ECTS: 4 Lecture, individual work with software, group work, presentation and discussion of tasks
	System Modelling & Simulation (E) /ILV / Course no.: PDE.5 / 1st semester / ECTS: 4 Lecture, individual work with software, group work, presentation and discussion of tasks
	Interaction Design & Product Design /ILV / Course no.: PDE.6 / 2nd semester / ECTS: 6 Lecture, individual work with software, group work, presentation and discussion of tasks

	Advanced Prototyping (E) /ILV / Course no.: PDE.7 / 2nd semester / ECTS: 3 Lecture, individual work with software, group work, presentation and discussion of tasks
Evaluation Methods Criteria	Requirements Engineering /ILV / Course no.: PDE.1 / 1st semester / ECTS: 3 Written exam

Evaluation Methods Criteria	Mechatronic Systems /ILV / Course no.: PDE.2 / 2nd semester / ECTS: 6 Written exam
	Sensors & Actuators /ILV / Course no.: PDE.3 / 1st semester / ECTS: 4 Written exam
	Embedded Systems /ILV / Course no.: PDE.4 / 1st semester / ECTS: 4 Examination, project
	System Modelling & Simulation (E) /ILV / Course no.: PDE.5 / 1st semester / ECTS: 4 Examination, project
	Interaction Design & Product Design /ILV / Course no.: PDE.6 / 2nd semester / ECTS: 6 Project
	Advanced Prototyping (E) /ILV / Course no.: PDE.7 / 2nd semester / ECTS: 3 Project

Module number:	**Digital Transformation**	**Scope:**	
DIT		**9**	**ECTS**
Degree program	University of Applied Sciences Master's course - Smart Products & Solutions Part-time		
Position in the curriculum	1st semester		
	4th semester		
Level	1st semester: Second cycle, Master / 4th semester: second cycle, Master		
Previous knowledge	1st semester: according to admission requirements / 1st semester: According to admission requirements / 4th semester: none		
Blocked	no		
Participant group	Bachelor graduates, beginners		
Literature recommendation	Digital Transformation (E) /ILV / Course no.: DIT.1 / 1st semester / ECTS: 3 Caudron J., Van Peteghem D.V.; Digital Transformation: A Model to Master Digital Disruption; BookBaby; 2016 Rauser A.; Digital Strategy: A Guide to Digital Business Transformation; North Carleston; 2016		
	Strategy & Business Model /ILV / Course no.: DIT.2 / 1st semester / ECTS: 3 Clement R., Schreiber D.; Internet-Ökonomie: Grundlagen und Fallbei- spiele der vernetzten Wirtschaft; Berlin; 2016 3rd edition Hoffmeister Ch.; Digital Business Modelling: Digitale Geschäftsmodelle entwickeln und strategisch verankern; München; 2015 McGrath R. G.; The End of Competitive Advantage: How to Keep Your Strategy Moving as Fast as Your Business; Massachusetts; 2013 Ries E.; The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses; St. Ives; 2013 Slama D., Puhlmann F., Mirrish J., Bhatnagar R.; Enterprise IoT: Strategies and Best Practices for Connected Products and Services; 2015		
	Privacy & Ethics /ILV / Course no.: DIT.3 / 4th semester / ECTS: 3 Heesen J. (publisher); Handbuch Medien- und Informationsethik; Stuttgart; 2016 Davisson A., Booth P. (publisher); Controversies in Digital Ethics; New York; 2016 Ess C.; Digital Media Ethics; Cambridge; 2014		
Skills acquisition	Digital Transformation (E) /ILV / Course no.: DIT.1 / 1st semester / ECTS: 3 The graduate / the student: * knows significant trends in the field of digitalization for companies * can evaluate the potential that digital transformation offers companies and describe development paths for their own company * knows the challenges that digital transformation poses to traditional companies * knows the importance of smart products in the context of digitalization * can derive a digitalization strategy from a divisional strategy		
	Strategy & Business Model /ILV / Course no.: DIT.2 / 1st semester / ECTS: 3 The graduate / the student: • understands the basics of the digital economy • knows the relationships between strategy, business model, business process model and process and methods to develop them • knows the requirements and elements of a business plan and can evaluate it • can develop business models suitable for identified framework conditions and transfer them into a business process model • is able to develop a business plan based on this		
	Privacy & Ethics /ILV / Course no.: DIT.3 / 4th semester / ECTS: 3 The graduate / the student: * has a good understanding of the fundamental laws, regulations and strategies in data protection * can explain basic positions of technical and business ethics using examples * can describe the steps of ethical judgement and argumentation and apply them in case studies from economic and technical practice * know the effects of technological change on work-life balance and family		
Course contents	Digital Transformation (E) /ILV / Course no.: DIT.1 / 1st semester / ECTS: 3 • Digital trends and waves of change • Difference between digital and traditional companies or their development paths • Design levels, framework conditions and challenges of digital change • Frameworks for the assessment of digital maturity • Smart products • Development • Ecosystem IoT and data • Use cases of smart products and solutions		
	Strategy & Business Model /ILV / Course no.: DIT.2 / 1st semester / ECTS: 3		

	* Fundamentals of the digital economy and trends * Digital business models * Importance of data * Approaches to developing strategies, business models and business process models * Business plans * Risk reduction/implementation

Course contents	Privacy & Ethics /ILV / Course no.: DIT.3 / 4th semester / ECTS: 3 * Introduction to data protection and its implementation * Definitions: personal data, data registers, publicly accessible data, pseudonymization * Informational self-determination, laws and regulations on data protection * Rights of those concerned * Organizational measures for the protection of personal data * Criminal/civil law aspects: Trade secrets, refusal to testify * Introduction to ethics as the science of good and right decisions and actions * Relevant factors of ethical judgement * Methods of ethical argumentation * Concept of responsibility * Business and technical ethics as sub-disciplines of ethics * Ethical challenges in digitalized and global information and knowledge societies * Effects of technological change on work life balance and family
Teaching and learning methods	Digital Transformation (E) /ILV / Course no.: DIT.1 / 1st semester / ECTS: 3 Lecture, group work, presentation and discussion of tasks
	Strategy & Business Model /ILV / Course no.: DIT.2 / 1st semester / ECTS: 3 Lecture, group work, presentation and discussion of tasks
	Privacy & Ethics /ILV / Course no.: DIT.3 / 4th semester / ECTS: 3 Lecture, group work, presentation and discussion of tasks
Evaluation Methods Criteria	Digital Transformation (E) /ILV / Course no.: DIT.1 / 1st semester / ECTS: 3 Seminar thesis
	Strategy & Business Model /ILV / Course no.: DIT.2 / 1st semester / ECTS: 3 Examination and presentation
	Privacy & Ethics /ILV / Course no.: DIT.3 / 4th semester / ECTS: 3 Written exam

Module number:	**Data management**	**Scope:**	
DAT		**18**	**ECTS**
Degree program	University of Applied Sciences Master's course - Smart Products & Solutions Part-time		
Position in the curriculum	1st semester		
	2nd semester		
	3rd semester		
Level	1st semester: Master / 2nd semester: second cycle, Master		
Previous knowledge	1st semester: according to admission requirements / 2nd semester: none / 3rd semester: none		
Blocked	no		
Participant group	Bachelor graduates, beginners		
Literature recommendation	Software Architecture & Programming /ILV / Course no.: DAT.1 / 1st semester / ECTS: 6 Klein B.; Einführung in Python 3: Für Ein- und Umsteiger; München; 2017 Lutz M.; Python - kurz & gut; 2014 Sweigart A.; Routineaufgaben mit Python automatisieren: Praktische Pro- grammierlösungen für Einsteiger; 2016 Theis Th.; Einstieg in Python: Ideal für Programmieranfänger geeignet; 2014		
	Data transmission /ILV / Course no.: DAT.2 / 2nd semester / ECTS: 6 Badach A., Hoffmann E.; Technik der IP-Netze: Internet-Kommunikation in Theorie und Einsatz; München; 2019, 4th edition Freyer U.; Nachrichten-Übertragungstechnik: Grundlagen, Komponenten, Verfahren und Anwendungen der Informations-, Kommunikations- und Medientechnik; Munich; 2017, 7th edition Gessler R., Krause Th.; Wireless-Netzwerke für den Nahbereich: Eingebettete Funksysteme: Vergleich von standardisierten und proprietären Verfahren; Wiesbaden; 2015, 2nd edition Tanenbaum A.S., Wetherall D.J.; Computernetzwerke; Munich; 2012, 5th edition		
	Data Analytics & Visualization /ILV / Course no.: DAT.3 / 3rd semester / ECTS: 6 Runkler Th.; Information Mining; vieweg; 2000 Langit L.; Smart Business Intelligence Solutions with Microsoft SQL Server; Microsoft Press; 2008 Petersohn H.; Data Mining; Oldenbourg; 2005 Provost F., Fawcett T.; Data Science for Business; O'Reilly; 2013 Milton M.; Head First Data Analysis; O'Reilly; 2009		
Skills acquisition	Software Architecture & Programming /ILV / Course no.: DAT.1 / 1st semester / ECTS: 6 The graduate / the student: * has an overview of programming languages * knows the interplay between hardware and software * knows the structure and structure of programs * can create programs in a high-level language * can use the development environment for a programming language * can implement manageable problems in a program		
	Data transmission /ILV / Course no.: DAT.2 / 2nd semester / ECTS: 6 The graduate / the student: * understands the characteristics of different data transmission technologies * can define requirements for data transmission * knows relevant evaluation criteria (latency, availability, data transmission rate etc.) for the selection of approaches and evaluation of requirements and approaches * can evaluate transmission technologies and protocols based on these requirements * knows architectures, procedures and protocols * can select and prototype transmission technologies		
	Data Analytics & Visualization /ILV / Course no.: DAT.3 / 3rd semester / ECTS: 6 The graduate / student:* can describe the contents, results/applications and working methods of Data Science * can convert "questions" into requirements in the context of Data Science * can define the process and tools based on these and implement / use them * knows a software with libraries for implementing data analysis and evaluation * can use appropriate software * can carry out suitable evaluations and analyses using the software for defined examples		
Course contents	Software Architecture & Programming /ILV / Course no.: DAT.1 / 1st semester / ECTS: 6 * Programming languages (classification, principles, history) * Detailed consideration of a modern programming language (e.g. Phyton) * Structure of programs * Data types, operators, flow structures * Development environment * Typical work steps * Setting up the development environment		

	* Programming (input, debugging, execution) * Independent planning and programming based on the programming languages taught in the lecture
Course contents	Data transmission /ILV / Course no.: DAT.2 / 2nd semester / ECTS: 6 * Fundamentals of data transmission * Wired data transmission * Wireless communication * Technologies and applications of modern networks * OSI, hybrid and TCP/IP reference model * Wired data transmission (I2C communication, serial communication) * Wireless networks * Sensor networks and approaches (e.g. MANET, WMN) * End-to-end protocols: UDP, TCP * Selected protocols of the application layer (e.g. FTP, HTTP, HTTPS, SMTP, MQTT) * Security concepts and access procedures * Release updates for networks * Elements of a measurement report * Selection of transmission technologies and protocols
	Data Analytics & Visualization /ILV / Course no.: DAT.3 / 3rd semester / ECTS: 6 * Introduction (data, information, knowledge, temporal components, objectives) * Data process (collection, preparation, analysis, presentation) * Data preparation (cleansing, transformation, rescaling, storage) * Approaches for the analysis of data * Presentation/visualization of results * Software (open source and proprietary software) * Machine Learning - process, approaches, implementation * Introduction to the software used e.g. Python * Collecting and preparing data using software * Analysis and presentation of sample data using various approaches (e.g. regression, decision trees, etc.)
Teaching and learning methods	Software Architecture & Programming /ILV / Course no.: DAT.1 / 1st semester / ECTS: 6 Lecture, individual work with software, group work, presentation and discussion of tasks
	Data transmission /ILV / Course no.: DAT.2 / 2nd semester / ECTS: 6 Lecture, group work, presentation and discussion of tasks
	Data Analytics & Visualization /ILV / Course no.: DAT.3 / 3rd semester / ECTS: 6 Lecture, individual work with software, group work, presentation and discussion of tasks
Evaluation Methods Criteria	Software Architecture & Programming /ILV / Course no.: DAT.1 / 1st semester / ECTS: 6 Written exam
	Data transmission /ILV / Course no.: DAT.2 / 2nd semester / ECTS: 6 Written exam
	Data Analytics & Visualization /ILV / Course no.: DAT.3 / 3rd semester / ECTS: 6 Written exam

Module number:	**Product management**	**Scope:**	
PRM		**8**	**ECTS**
Degree program	University of Applied Sciences Master's course - Smart Products & Solutions Part-time		
Position in the curriculum	1st semester		
	3rd semester		
Level			
Previous knowledge	1st semester: according to admission requirements / 3rd semester: none		
Blocked	no		
Participant group	Bachelor graduates, beginners		
Literature recommendation	Product Management /ILV / Course no.: PRM.1 / 1st semester / ECTS: 3 Aumayr K.J.; Erfolgreiches Produktmanagement: Tool-Box für das professionelle Produktmanagement und Produkt-marketing; Wiesbaden; 2019 5th edition Hermann A., Albers S.; Handbuch Produktmanagement: Strategieentwicklung – Produktplanung – Organisation – Kontrolle; Wiesbaden; 2018 7th edition Pichler R.; Agiles Produktmanagement mit Scrum: Erfolgreich als Product Owner arbeiten; Heidelberg; 2013 2nd edition		
	Product Quality & Risk Management (E) /ILV / Course no.: PRM.2 / 3rd semester / ECTS: 5 Börcsök, J.; Functional Safety: Basic Principles of Safety-related Systems; 2020 Kobes, P; Guideline Industrial Security: IEC 62443 is easy; 2017 Tolonen; Brig's Handbook of Methods & Research in Product Management and Quality Control; 2018 Stamatis D.H.; Advanced Product Quality Planning: The Road to Success; Boca Raton; 2018		
Skills acquisition	Product Management /ILV / Course no.: PRM.1 / 1st semester / ECTS: 3 The graduate, the student: * knows the tasks of product management * knows the process and related tools and can apply them * knows the specifics of product management of smart products and solutions		
	Product Quality & Risk Management (E) /ILV / Course no.: PRM.2 / 3rd semester / ECTS: 5 The graduate / the student: * can consider important criteria such as quality, safety, reliability, availability and resource consumption in product development * knows methods for assessing product quality and product risk		
Course contents	Product Management /ILV / Course no.: PRM.1 / 1st semester / ECTS: 3 * Special features of smart products and solutions * New product management approaches * Market research * Product strategy * Purchase decision criteria or acceptance (drivers, obstacles) * Special features of introduction and marketing * Data-based decisions * Life cycle management		
	Product Quality & Risk Management (E) /ILV / Course no.: PRM.2 / 3rd semester / ECTS: 5 * Product & process life cycle * Risk determination strategies * Planning of safe systems (concepts & strategies) * Planning of secure systems (threat analysis, countermeasures) * Structure & concepts of reliable control systems		
Teaching and learning methods	Product Management /ILV / Course no.: PRM.1 / 1st semester / ECTS: 3 Lecture, group work, presentation and discussion of tasks		
	Product Quality & Risk Management (E) /ILV / Course no.: PRM.2 / 3rd semester / ECTS: 5 Lecture, group work, presentation and discussion of tasks		
Evaluation Methods Criteria	Product Management /ILV / Course no.: PRM.1 / 1st semester / ECTS: 3 Written exam		
	Product Quality & Risk Management (E) /ILV / Course no.: PRM.2 / 3rd semester / ECTS: 5 Written exam		

Module number:	**Social Skills**	**Scope:**	
SSK		**11**	**ECTS**
Degree program	University of Applied Sciences Master's course - Smart Products & Solutions Part-time		
Position in the curriculum	2nd semester		
	3rd semester		
Level			
Previous knowledge	2nd semester: none / 3rd semester: None		
Blocked	no		
Participant group	Bachelor graduates, beginners		
Literature recommendation	Project Management (E) /ILV / Course no.: SSK.1 / 2nd semester / ECTS: 3 Barker St., Cole R.; Brilliant Project Management, What the best project managers know, do and say; Pearson; 2012 Ding R.; Key Project Management based on effective project thinking; Springer; 2019 Karlgaard R., Malone M.S.; Team Genius: The New Science of High Performing Organisations; 2015 Marle F., Vidal A.; Managing complex, high risk projects, Springer; 2016 Schwindt Ch., Zimmermann J.; Handbook on Project Management and Scheduling Vol 2; Springer; 2015 N.N.; PMBOOK guide; A guide to the project management body of knowledge; Project Management Institute; 2013 Roudias J.; Mastering principles and practices in PMBOK, PRINCE2, and Scrum; Pearson FT Press; 2013		
	Change Management /ILV / Course no.: SSK.2 / 2nd semester / ECTS: 3 Doppler K., Lauterburg Ch.; Change Management: Den Unternehmens-wandel gestalten; Campus, 13th edition, 2014 Berner W., Change!: 15 Fallstudien zu Sanierung, Turnaround, Prozess-optimierung, Reorganisation und Kulturver-änderung, Schäfer Poschl, 2nd edition, 2015 Kotter J.P.; Leading Change; Harvard, 2011		
	Value Selling & Communication /ILV / Course no.: SSK.3 / 3rd semester / ECTS: 5 Gourville J.T.; Eager Sellers and Stony Buyers, Understanding the Psychology of New-Product Adoption; 2006; Har-vard Business Review Meyers-Levy J., Tybout A.M.; Schema Congruity as a Basis for Product Evaluation; Journal of Consumer Research Cialdini R.B.; Influence: The Psychology of Persuasion; Harlow; 2014		
Skills acquisition	Project Management (E) /ILV / Course no.: SSK.1 / 2nd semester / ECTS: 3 The graduate / the student: * can apply the approaches, functions, methods and tools of project management * can work, organize and form teams in a project-oriented way and lead them appropriately * knows tools and documentation standards * can apply PM tools and standards * knows frameworks for project management * knows the basic communication, moderation and negotiation techniques as well as the most important leadership tools * can use these tools in steering project teams and coordinating with stakeholders in a way that is appropriate for the situation and the employees * can monitor project portfolios		
	Change Management /ILV / Course no.: SSK.2 / 2nd semester / ECTS: 3 The graduate, the student: * knows the importance of change management for the introduction of products / services * knows the most important approaches, models and terms * understands the individual and social aspects of change and knows the main causes of resistance and conflicts * knows procedural models or methods, techniques and tools for change management * can integrate the topic of change management in change projects and can apply procedural models or methods, techniques and tools to specific practical cases		
	Value Selling & Communication /ILV / Course no.: SSK.3 / 3rd semester / ECTS: 5 The graduate / the student: * can use the opportunities and risks of innovations as a basis for new, superior value propositions in the market * can analyze the ideal purchase process for innovation from the customer's point of view and then derive value propositions		
Course contents	Project Management (E) /ILV / Course no.: SSK.1 / 2nd semester / ECTS: 3		

	* Basics of project management * Project management methods and tools * Roles in projects; communication and documentation * Problem, conflict, risk and crisis management * Theories/models and procedures for teambuilding * Tools for supporting teambuilding
	Change Management /ILV / Course no.: SSK.2 / 2nd semester / ECTS: 3
	* Importance of change management * Individual and social aspects of change * Resistance, conflict and crisis * Basic approaches to change management * Types of change * Models of change (e.g. Lewin, GE-CAP, etc.)

Course contents	* Models of change (e.g. Lewin, GE-CAP, etc.) * (Project) management of change: Generic phase model and integration in projects * Techniques and tools of change (e.g: Target circle, change stretch, WIIFM, empathy map, etc.)
	Value Selling & Communication /ILV / Course no.: SSK.3 / 3rd semester / ECTS: 5 * Analysis of customer behavior in the buying process * Development of value propositions * Benefit-oriented selling

Teaching and learning methods	Project Management (E) /ILV / Course no.: SSK.1 / 2nd semester / ECTS: 3 Lecture, group work, presentation and discussion of tasks
	Change Management /ILV / Course no.: SSK.2 / 2nd semester / ECTS: 3 Lecture, group work, presentation and discussion of tasks
	Value Selling & Communication /ILV / Course no.: SSK.3 / 3rd semester / ECTS: 5 Lecture, group work, presentation and discussion of tasks
Evaluation Methods Criteria	Project Management (E) /ILV / Course no.: SSK.1 / 2nd semester / ECTS: 3 Project
	Change Management /ILV / Course no.: SSK.2 / 2nd semester / ECTS: 3 Written exam
	Value Selling & Communication /ILV / Course no.: SSK.3 / 3rd semester / ECTS: 5 Written exam

Module number:	**Practical Transfer**	**Scope:**	
PXT		**7**	**ECTS**
Degree program	University of Applied Sciences Master's course - Smart Products & Solutions Part-time		
Position in the curriculum	2nd semester		
	3rd semester		
Level	3rd semester: Master		
Previous knowledge	3rd semester: none		
Blocked	no		
Participant group	Bachelor graduates, beginners		
Literature recommendation	Study trip (E) /ILV / Course no.: PXT.1 / 2nd semester / ECTS: 3 Thomas D.C., Peterson M.F.; Cross-Cultural Management: Essential Concepts; Los Angeles; 2017 Beise M.; Lead Markets. Country-Specific Success Factors of the Global Diffusion of Innovations; Berlin; 2014		
	Practical Project /PT / Course no.: PXT.2 / 3rd semester / ECTS: 4 Patzak G., Rattay G.; Projekt Management. Leitfaden zum Management von Projekten, Projektportfolios und projekt-orientierten Unternehmen; Wien; 2017, 7th edition Schöneck N.M., Voß W.; Das Forschungsprojekt: Planung, Durchführung und Auswertung einer quantitativen Studie; Wiesbaden; 2013 2nd edition		
Skills acquisition	Study trip (E) /ILV / Course no.: PXT.1 / 2nd semester / ECTS: 3 The graduate / the student: * knows the cultural specifics of the respective country in terms of innovation, legal framework and management * knows the specifics of the host country regarding smart products and solutions (technology, acceptance, business models, etc.) * knows and understands the research strategy/research system of the host country regarding smart products and solutions		
	Practical Project /PT / Course no.: PXT.2 / 3rd semester / ECTS: 4 The graduate / the student: * can question and define tasks accordingly * can derive a suitable scientific methodology based on the task * can carry out intensive study of literature (state of the art approaches) * can transfer research results to applied problems * can lead projects with relevant content concerning the study * can structure projects/project teams (results, times, resources) * knows the tasks and responsibilities as a project member		
Course contents	Study trip (E) /ILV / Course no.: PXT.1 / 2nd semester / ECTS: 3 * International management in a country-specific context * R and D strategy and systems at country level * Technology and innovation approaches		
	Practical Project /PT / Course no.: PXT.2 / 3rd semester / ECTS: 4 * Working in a team and team organization * Deducing a problem * Choosing a suitable methodology and corresponding tools * Planning, implementing and managing projects * Integrative applications of acquired skills and knowledge * Preparing and communicating results * Self-reflection		
Teaching and learning methods	Study trip (E) /ILV / Course no.: PXT.1 / 2nd semester / ECTS: 3 Lecture, group work, presentation and discussion of tasks		
	Practical Project /PT / Course no.: PXT.2 / 3rd semester / ECTS: 4 Group work		
Evaluation Methods Criteria	Study trip (E) /ILV / Course no.: PXT.1 / 2nd semester / ECTS: 3 Report		

	Practical Project /PT / Course no.: PXT.2 / 3rd semester / ECTS: 4 Project

Module number:	Elective subject	Scope:	
WPF		11	ECTS
Degree program	University of Applied Sciences Master's course - Smart Products & Solutions Part-time		
Position in the curriculum	3rd semester		
	4th semester		
Level	3rd semester: 2. Study cycle, Master / 3rd semester: Master's course / 3rd semester: second cycle, Master's / 4th semester: Master's course / 4th semester: Master's course		
Previous knowledge	3rd semester: none / 3rd semester: no prerequisites / 3rd semester: No prerequisites / 3rd semester: not applicable / 4th semester: none / 4th semester: no prerequisites / 4th semester: No prerequisites		
Blocked	no		
Participant group	Bachelor graduates, beginners		
Literature recommendation	Quantitative Process and Quality Management (Six Sigma) (elective)* /ILV / Course no.: WPF.1 / 3rd semester / ECTS: 4 Töpferer, A.; Six Sigma Konzeption und Erfolgsbeispiele für praktizierende Null-Fehler-Qualität; Berlin/Heidelberg/New York 2007; 4th edition George M.; Rowlands D.; Price M.; Maxey J.; The Lean Six Sigma Pocket Toolbook; New York; 2005 Lunau St. (publisher); Six Sigma + Lean Toolset; 5th edition; Heidelberg; 2014		
	Trends in Data Science (elective)* /ILV / Course no.: WPF.10 / 4th semester / ECTS: 3 Due to the changeability of the content, only a few web sources are listed here as examples, which are currently strongly represented in the area of Data Science Trends: - Medium (2020): Towards Data Science (Ed. 1), online, https://towardsdatascience.com/. - KDNuggets (2020): Knowledge Discovery Nuggets (Ed. 1), online, https://www.kdnuggets.com/.		
	Trends in Smart Products(elective)* /ILV / Course no.: WPF.11 / 4th semester / ECTS: 3 Huber W.; Industrie 4.0 kompakt – Wie Technologien unsere Wirtschaft und unsere Unternehmen verändern: Transformation und Veränderung des gesamten Unternehmens; Wiesbaden; 2018 Iyer B., Venkatraman V.; "What comes after smart products?", Havard Business Review; 2015 Roth A.; Einführung und Umsetzung von Industrie 4.0: Grundlagen, Vorgehensmodell und Use Cases aus der Praxis; Wiesbaden; 2016		
	Trends in Web Technologies(elective)* /ILV / Course no.: WPF.12 / 4th semester / ECTS: 3 PRIMARY LITERATURE: - European Journal of Information Systems - Information Systems Journal - Information Systems Research - Journal of AIS - Journal of Information Technology - Journal of MIS - Journal of Strategic Information Systems - MIS Quarterly		
	Application-oriented analysis platforms (elective)* /ILV / Course no.: WPF.2 / 3rd semester / ECTS: 4 PRIMARY LITERATURE: - Mishra, A. (2019): Machine Learning in the AWS Cloud: Add Intelligence to Applications with Amazon SageMaker and Amazon Rekognition (Ed. 1), Wiley, Chichester (ISBN: 978-1119556718) - Klinkenberg, R., Hofmann, M. (2016): RapidMiner (Ed. 1), Chapman and Hall, Farnham (ISBN: 978-1482205503) SECONDARY LITERATURE: - Lakshmanan, V. (2017): Data Science on the Google Cloud Platform: Implementing End-to-End Real-Time Data Pipelines: From Ingest to Machine Learning (Ed. 1), O'Reilly Media, Farnham (ISBN: 978-1491974537)		
	Internet of Things (elective)* /ILV / Course no.: WPF.3 / 3rd semester / ECTS: 4 Perry L.; Internet of Things for Architects: Architecting IoT solutions by implementing sensors, communication infrastructure, edge computing, analytics, and security; Birmingham; 2018 Sinclair B.; IoT Inc: How Your Company Can Use the Internet of Things to Win in the Outcome Economy; 2017 Thomas O., Nüttgens M., Fellmann M. (editor); Smart Service Engineering: Konzepte und Anwendungsszenarien für die digitale Transformation; Wiesbaden; 2017		
	Business Platforms & Cloud Computing (elective)* /ILV / Course no.: WPF.4 / 3rd semester / ECTS: 4 PRIMARY LITERATURE: - Erl, T., Puttini, R., Mahmood, Z: Cloud Computing: Concepts, Technology & Architecture. 2013 - Jackson, K., Goessling, S.: Architecting Cloud Computing Solutions: Build cloud strategies that align technology and economics while effectively managing risk. 2018 - Evans, D., Schmalensee, R.: Matchmakers: The New Economics of Multisided Platforms. 2016		
	Process Automation (elective)* /ILV / Course no.: WPF.5 / 3rd semester / ECTS: 4 Reicher M., Weber B.: Enabling Flexibility in Process-aware Information Systems, Springer 2012, chapters 2-4 Quarre, F.: Robotic Process Automation, O'Reilly, 2019		

	Salatino, M., Aliverti, E.: jBPM 6 Developer Guide; Packt Publishing, 2014 Allweyer, Thomas: BPMN 2.0 - Business Process Model and Notation: Einfuehrung in den Standard fuer die Geschaeftsprozessmodellierung.- Books on Demand, 2015
	Data Visualization & Visual Analytics (elective)* /ILV / Course no.: WPF.6 / 3rd semester / ECTS: 4 PRIMARY LITERATURE: - Chang, W. (2013): R Graphics Cookbook: Practical Recipes for Visualizing Data (Ed. 1), O'Reilly, Farnham (ISBN: 978-1449316952) - Chen, C.; Härdle, W. K.; Unwin, A. (2008): Handbook of Data Visualization (Ed. 1), Springer, Berlin (ISBN: 978-3-662-50074-3) SECONDARY LITERATURE: - Dale, K. (2016): Data Visualization with Python and Javascript: Scrape, Clean, Explore & Transform Your Data (Ed. 1), O'Reilly, Farnham (ISBN: 978-1491920510) - Murray, S. (2017): Interactive Data Visualization for the Web: An Introduction to Designing with D3 (Ed. 2), O'Reilly, Farnham (ISBN: 978-1491921289)

Literature recommendation	Agile Product Development (elective)* /ILV / Course no.: WPF.7 / 3rd semester / ECTS: 4 Pfeffer J.; Produkt-Entwicklung: Lean & Agile; Munich; 2019 Schröder A.; Agile Produktentwicklung: Schneller zur Innovation – erfolgreicher am Markt; 2018
	Human-Computer Interaction (elective)* /ILV / Course no.: WPF.8 / 3rd semester / ECTS: 4 - A. Dix, J. Finlay, G.D. Abowd, R. Beale: Human-Computer Interaction.Third Edition, Prentice Hall 2003, ISBN 978-0130461094 - Cooper, Reimann, and Cronin; About Face 3: The Essentials of Interaction Design; Wiley, 2007. ISBN 0470084111 - Lazar, Feng, and Hochheiser; Research Methods in Human-Computer Interaction; Wiley, 2010. ISBN 0470723378 - Stone, Jarrett, Woodruffe, and Minocha; User Interface Design and Evaluation; Morgan Kaufmann, March 2005. ISBN 0120884364 - A. Kerren, A. Ebert, J. Meyer: Human-Centered Visualization Environments.Springer 2007, ISBN 978-3540719489 - Sarodnick, F., & Brau, H.: Methoden der Usability-Evaluation. Bern: Hans Huber, 2011. - Shneiderman, B., and Plaisant, C.: Designing the user interface (5th ed.). Boston: Addison-Wesley, 2009. - Nielsen, Jakob: Designing Web Usability, engl. Issue, Market and Technology, 2004
Skills acquisition	Quantitative Process and Quality Management (Six Sigma) (elective)* /ILV / Course no.: WPF.1 / 3rd semester / ECTS: 4 The graduate, the student: * Knows the basics of descriptive and conclusive statistics * Knows how to examine measurement setups for repeatability and reproducibility * Can calculate sample sizes * Can control the stability of process results using statistical control methods * Can evaluate the ability of processes to meet customer requirements * Knows methods to search for the causes of result deviations using test procedures * Knows the basic functions of the Minitab statistics software * Can use Minitab in process analysis
	Trends in Data Science (elective)* /ILV / Course no.: WPF.10 / 4th semester / ECTS: 3 The following learning outcomes are developed in the course: - Students are familiar with current thematic trends in the field of data science. - Students are familiar with current technological developments in the field of data science. - Students are familiar with current practical issues in the field of data science.
	Trends in Smart Products(elective)* /ILV / Course no.: WPF.11 / 4th semester / ECTS: 3 The graduate / the student: * understands the concepts of smart applications such as Smart House, Smart City, Smart Production, Connected Vehicles etc. * knows and understands the latest trends in the field of these applications
	Trends in Web Technologies(elective)* /ILV / Course no.: WPF.12 / 4th semester / ECTS: 3 The following learning outcomes are developed in the course: - Students will be aware of current thematic trends in the field of web technologies and applications. - Students are familiar with current technological developments in the field of web technologies and applications. - Students are familiar with current practical issues in the field of web technologies and applications.
	Application-oriented analysis platforms (elective)* /ILV / Course no.: WPF.2 / 3rd semester / ECTS: 4 The following learning outcomes are developed in the course: - Students are familiar with different, application-oriented analysis platforms (e.g. KNIME, RapidMiner, Grafana) - Students can compare the analysis platforms they have learned with regard to their suitability for a specific application. - Students have gained first application experience with the platforms presented.
	Internet of Things (elective)* /ILV / Course no.: WPF.3 / 3rd semester / ECTS: 4 The graduate, the student: * knows basic IOT architectures * knows methods of data generation * knows basics of data transmission * knows options of data storage * knows forms of data visualization * understands challenges of data security
	Business Platforms & Cloud Computing (elective)* /ILV / Course no.: WPF.4 / 3rd semester / ECTS: 4 The following learning outcomes are developed in the course: - The students know common business platforms - The students know advantages and disadvantages of business platforms and can select suitable platforms - The students know the basics of cloud computing and cloud platforms - The students know options for designing interfaces and how to use them

	Process Automation (elective)* /ILV / Course no.: WPF.5 / 3rd semester / ECTS: 4 * Knows challenges in process automation

	* Can select processes for automation * Knows procedures and factors for successful process automation * Can create process automation in selected software * Knows interfaces to ERP and CRM systems * Knows procedures for interprocess communication and can implement them * Knows the basic structure of cloud computing-based IT applications for process automation in the operational environment using Microsoft Dynamics 365 as an example * Knows basic and advanced functionalities of process automation under Microsoft Dynamics 365 * Can implement browser and app-based UIs for process automation using Microsoft technologies as an example
Skills acquisition	Data Visualization & Visual Analytics (elective)* /ILV / Course no.: WPF.6 / 3rd semester / ECTS: 4 The following learning outcomes are developed in the course: - Students will have basic knowledge of data visualization and visual communication. - Students can develop visualizations independently and use them for communication purposes. - Students can work with different presentation tools and presentation libraries to present data and analysis results in a meaningful way.
	Agile Product Development (elective)* /ILV / Course no.: WPF.7 / 3rd semester / ECTS: 4 The graduate / the student: * Knows agile process methods * Knows organizational roles in the agile process * Knows the flow of an agile project (sprints, dailies, demos, retros) * Can coach an agile project (e.g. question techniques) * Knows the experiences of agile projects from software development * Knows the challenge of developing smart products * Knows methods of product development (e.g. FMEA, TRIZ) * Knows advantages of hybrid process methods * Knows the role of management in the agile process
	Human-Computer Interaction (elective)* /ILV / Course no.: WPF.8 / 3rd semester / ECTS: 4 Graduates know the basics of designing web-based or mobile interaction interfaces and are able to apply them independently in the context of interactive systems. In this context, graduates acquire knowledge of the basic concepts of the work and research field of human-computer interaction: Usability, user experience and user interface design. Graduates acquire the basic knowledge to design interactive applications according to a human-centred design process and to analyze and evaluate user interfaces with usability evaluation methods.
	Trends in ERP (elective)* /ILV / Course no.: WPF.9 / 4th semester / ECTS: 3 The graduate / the student: * Knows current trends in the field of ERP systems
Course contents	Quantitative Process and Quality Management (Six Sigma) (elective)* /ILV / Course no.: WPF.1 / 3rd semester / ECTS: 4 * Repetition Basics of Descriptive Statistics * Measurement System Analysis * Sampling * Statistical Process Control * Process Control Charts * Process Capability Analysis * Components of Variants Analysis (COV) * Repetition Basics of Concluding Statistics * Failure Cause Determination via Hypothesis Testing (T-test, Chi-Sq, ANOVA) * Multiple Regression Analysis
	Trends in Data Science (elective)* /ILV / Course no.: WPF.10 / 4th semester / ECTS: 3 The contents of this course are not set, but will be adapted to the current prevailing trends. Content examples may include: - New technologies in the field of Big Data Processing - Trends in programming languages in data analysis - New concepts of data processing (e.g. Data Lake) - New questions in the field of data science research - New questions in data science practice
	Trends in Smart Products(elective)* /ILV / Course no.: WPF.11 / 4th semester / ECTS: 3 * Current best practice approaches and concepts in application areas (e.g. Smart Home, Smart City, Smart Production, Connected Vehicles, etc.) * Current best practice approaches with regard to development processes and tools * Current research and development activities or research and development results
	Trends in Web Technologies(elective)* /ILV / Course no.: WPF.12 / 4th semester / ECTS: 3

	The contents of this course are not set, but will be adapted to the current prevailing trends. Content examples may include: - New technologies in the field of web architectures - Trends in the field of programming languages on the web - New design concepts in the field of web applications - New questions in the field of research in web technologies and applications

Course contents	- New questions in the field of web development practice
	Application-oriented analysis platforms (elective)* /ILV / Course no.: WPF.2 / 3rd semester / ECTS: 4 The following content is discussed in the course: - Presentation of different user-oriented analysis platforms (e.g. KNIME, RapidMiner, Grafana) - Presentation of different cloud solutions for data analysis (e.g. Google Cloud, AWS, Azure) - Application of the platforms presented using the example of analysis data sets - Discussion of the different approaches
	Internet of Things (elective)* /ILV / Course no.: WPF.3 / 3rd semester / ECTS: 4 Introduction * IoT architecture (e.g. reference models) * Requirements for IOT systems * IOT data transmission protocols * Use of IOT in an industrial context (examples) * Basics of sensor technology * Basics of embedded systems Implementation * Procedure for implementing IOT * Prototypical implementation of IOT * Selection of sensors * Collection, visualization and evaluation of data * Implementation challenges
	Business Platforms & Cloud Computing (elective)* /ILV / Course no.: WPF.4 / 3rd semester / ECTS: 4 Students are given an overview of common business platforms and cloud computing. In addition, the advantages and disadvantages of the respective platforms are discussed. Students are therefore able to select suitable platforms for a given problem. Students gain practical experience with selected platforms using case studies. In addition, methods for defining interfaces are discussed with the students.
	Process Automation (elective)* /ILV / Course no.: WPF.5 / 3rd semester / ECTS: 4 * Basic terms: Business process, workflow, BPMS, WFMS, RPA, etc. * Selection criteria for workflow engines for process automation * Architecture and integration of workflows for process automation * Overview of interprocess communication * Transactional properties of processes, simulation and code generation * Basics of Microsoft Dynamics 365: Modules and navigation, basic entities and standard workflows * Organizational and technical implementation with configuration and declarative programming
	Data Visualization & Visual Analytics (elective)* /ILV / Course no.: WPF.6 / 3rd semester / ECTS: 4 The following content is discussed in the course: - Evaluation tools with visual orientation, e.g. Bl tools such as MS PowerBl, Tableau, QlikView - Display libraries, e.g. matplotlib. pyplot, gglot2 - Rules of visual communication, e.g. Hichert SUCCESSSS
	Agile Product Development (elective)* /ILV / Course no.: WPF.7 / 3rd semester / ECTS: 4 * Overview of agile process methods * Roles in the agile process * Running an agile project (sprins, dailies, demos, retros) * Coaching an agile project (e.g. question techniques) * Experience with agile projects from software development * The challenge of developing smart products * Methods of product development (e.g. FMEA, TRIZ) * Advantages of hybrid process methods * Role of management in the agile process
	Human-Computer Interaction (elective)* /ILV / Course no.: WPF.8 / 3rd semester / ECTS: 4 The lecture teaches basic concepts from the field of human-computer interaction (usability, user experience, user interface design) and information visualization. This includes the following focal points: User interface architectures; design criteria, guidelines and standards for the creation and modelling of user interfaces of interactive systems; approaches and methods (quantitative and qualitative) for the evaluation of user interfaces of interactive systems; web style guides and evaluation criteria for websites (e.g. with regard to accessibility); basics of information presentation and data visualization; interactive information visualization; the theoretical lecture contents are prepared in the exercise using practical examples and implemented in a small project (usability evaluation) in a team.
	Trends in ERP (elective)* /ILV / Course no.: WPF.9 / 4th semester / ECTS: 3

	* Current developments in the field of business application systems with special reference to ERP systems and business process management * Models, examples, best practice cases
Teaching and learning methods	Quantitative Process and Quality Management (Six Sigma) (elective)* /ILV / Course no.: WPF.1 / 3rd semester / ECTS: 4 Lecture, individual work with software, group work, presentation and discussion of tasks

Teaching and learning methods	Trends in Data Science (elective)* /ILV / Course no.: WPF.10 / 4th semester / ECTS: 3 The following methods are used: - Lecture with discussion - Interactive workshop
	Trends in Smart Products(elective)* /ILV / Course no.: WPF.11 / 4th semester / ECTS: 3 Lecture, group work, presentation and discussion of tasks
	Trends in Web Technologies(elective)* /ILV / Course no.: WPF.12 / 4th semester / ECTS: 3 The following methods are used: - Lecture with discussion - Interactive workshop
	Application-oriented analysis platforms (elective)* /ILV / Course no.: WPF.2 / 3rd semester / ECTS: 4 The following methods are used: - Lecture with discussion - Processing of exercises - Interactive workshop
	Internet of Things (elective)* /ILV / Course no.: WPF.3 / 3rd semester / ECTS: 4 Lecture, individual work with software, group work, presentation and discussion of tasks
	Business Platforms & Cloud Computing (elective)* /ILV / Course no.: WPF.4 / 3rd semester / ECTS: 4 Lecture, group work, presentation and discussion of tasks
	Process Automation (elective)* /ILV / Course no.: WPF.5 / 3rd semester / ECTS: 4 Lecture, individual work with software, group work, presentation and discussion of tasks
	Data Visualization & Visual Analytics (elective)* /ILV / Course no.: WPF.6 / 3rd semester / ECTS: 4 The following methods are used: - Lecture with discussion - Interactive workshop - Case studies
	Agile Product Development (elective)* /ILV / Course no.: WPF.7 / 3rd semester / ECTS: 4 Lecture, group work, presentation and discussion of tasks
	Human-Computer Interaction (elective)* /ILV / Course no.: WPF.8 / 3rd semester / ECTS: 4 Lecture, group work (project), presentation and discussion of tasks
	Trends in ERP (elective)* /ILV / Course no.: WPF.9 / 4th semester / ECTS: 3 Lecture, group work, presentation and discussion of tasks
Evaluation Methods Criteria	Quantitative Process and Quality Management (Six Sigma) (elective)* /ILV / Course no.: WPF.1 / 3rd semester / ECTS: 4 Written exam
	Trends in Data Science (elective)* /ILV / Course no.: WPF.10 / 4th semester / ECTS: 3 Seminar thesis
	Trends in Smart Products(elective)* /ILV / Course no.: WPF.11 / 4th semester / ECTS: 3 Seminar thesis
	Trends in Web Technologies(elective)* /ILV / Course no.: WPF.12 / 4th semester / ECTS: 3 Seminar thesis
	Application-oriented analysis platforms (elective)* /ILV / Course no.: WPF.2 / 3rd semester / ECTS: 4 Seminar thesis
	Internet of Things (elective)* /ILV / Course no.: WPF.3 / 3rd semester / ECTS: 4 Written exam
	Business Platforms & Cloud Computing (elective)* /ILV / Course no.: WPF.4 / 3rd semester / ECTS: 4 Seminar thesis
	Process Automation (elective)* /ILV / Course no.: WPF.5 / 3rd semester / ECTS: 4 Written exam
	Data Visualization & Visual Analytics (elective)* /ILV / Course no.: WPF.6 / 3rd semester / ECTS: 4 Seminar thesis

Evaluation Methods Criteria	Agile Product Development (elective)* /ILV / Course no.: WPF.7 / 3rd semester / ECTS: 4 Written exam
	Human-Computer Interaction (elective)* /ILV / Course no.: WPF.8 / 3rd semester / ECTS: 4 Seminar thesis
	Trends in ERP (elective)* /ILV / Course no.: WPF.9 / 4th semester / ECTS: 3 Seminar thesis

Module number:	**Master thesis**	**Scope:**	
MA		**26**	**ECTS**
Degree program	University of Applied Sciences Master's course - Smart Products & Solutions Part-time		
Position in the curriculum	3rd semester 4th semester		
Level	3rd semester: Master / 4th semester: second cycle, Master		
Previous knowledge	3rd semester: none / 4th semester: according to admission requirements / 4th semester: none		
Blocked	no		
Participant group	Bachelor graduates, beginners		
Literature recommendation	Academic Methods /SE / Course no.: MA.1 / 3rd semester / ECTS: 2 Schütz M., Röbken H.; Bachelor- und Masterarbeiten verfassen: Abschlussarbeiten in Organisationen; Springer Gabler; 2020; 2nd edition Theisen M. R.; Wissenschaftliches Arbeiten: Erfolgreich bei Bachelor- und Masterarbeit; Vahlen; 2017; 17th edition Colloquium for the Master thesis /SE / Course no.: MA.2 / 4th semester / ECTS: 2 Atteslander, P.; Methoden der empirischen Sozialforschung (13. A.). Berlin: Erich Schmidt Verlag; 2010 Bänsch, A.; Wissenschaftliches Arbeiten (11. A.). Berlin: De Gruyter Oldenbourg; 2013 Mayring, P.; Die Praxis der Qualitativen Inhaltsanalyse (2. A.). Weinheim, Basel: Beltz Verlag; 2008 Theisen, M. R.; Wissenschaftliches Arbeiten: Technik - Methodik - Form (15. A.). Munich: Vahlen; 2011 Master thesis /UE / Course no.: MA.3 / 4th semester / ECTS: 22 Atteslander, P.; Methoden der empirischen Sozialforschung (13. A.). Berlin: Erich Schmidt Verlag; 2010 Bänsch, A.; Wissenschaftliches Arbeiten (11. A.). Berlin: De Gruyter Oldenbourg; 2013 Mayring, P.; Die Praxis der Qualitativen Inhaltsanalyse (2. A.). Weinheim, Basel: Beltz Verlag; 2008 Theisen, M. R.; Wissenschaftliches Arbeiten: Technik - Methodik - Form (15. A.). Munich: Vahlen; 2011		
Skills acquisition	Academic Methods /SE / Course no.: MA.1 / 3rd semester / ECTS: 2 The graduate / the student: * knows scientific methods * can formulate research questions and write an exposé on a specialist topic * can work on a specialist topic using scientific methods * can research literature independently * can write a scientific poster on a specialist topic Colloquium for the Master thesis /SE / Course no.: MA.2 / 4th semester / ECTS: 2 The graduate / the student: • knows how scientific reviews are conducted • knows how to present results to a scientific community • can critically question scientific findings Master thesis /UE / Course no.: MA.3 / 4th semester / ECTS: 22 The graduate / the student: * can independently write a scientific paper on a specialist topic in the field of product development, product management, smart products		
Course contents	Academic Methods /SE / Course no.: MA.1 / 3rd semester / ECTS: 2 * Advancing the methods and approaches of scientific work * Research design for scientific questions * Qualitative and quantitative research methods * Use of methods and tools * State of the art literature research and use of citation tools e.g. Citavi * Preparation of the exposé for the Master thesis * Notes on the formal design of the Master thesis Colloquium for the Master thesis /SE / Course no.: MA.2 / 4th semester / ECTS: 2		

	• Support of the students during the preparation of the Master thesis • Presentation and discussion of the question/ hypothesis, structure of the Master thesis, scientific methodology and formal design of the Master thesis
	Master thesis /UE / Course no.: MA.3 / 4th semester / ECTS: 22 * Supervising the students during the preparation of the Master thesis * Presentation and discussion of the question/hypothesis, structure of the Master thesis, scientific methodology and formal design of the Master thesis * Review of the analysis part and critical reflection for evaluation * Structure of the thesis, appropriate division, clear result structure and conclusion * Short overview of the Master's examination and its requirements
Teaching and learning methods	Academic Methods /SE / Course no.: MA.1 / 3rd semester / ECTS: 2 Lecture, individual work, presentation and discussion of tasks

Teaching and learning methods	Colloquium for the Master thesis /SE / Course no.: MA.2 / 4th semester / ECTS: 2 Lecture, presentation and discussion of tasks
	Master thesis /UE / Course no.: MA.3 / 4th semester / ECTS: 22 Master thesis
Evaluation Methods Criteria	Academic Methods /SE / Course no.: MA.1 / 3rd semester / ECTS: 2 Student research project
	Colloquium for the Master thesis /SE / Course no.: MA.2 / 4th semester / ECTS: 2 Presentation
	Master thesis /UE / Course no.: MA.3 / 4th semester / ECTS: 22 Master thesis

2.4 Internship

Internship (semester information, duration in weeks per semester)	No

2.5 Semester Abroad

Obligatory semester abroad (semester specification)	No

3 ADMISSION REQUIREMENTS

The general admission requirements are regulated by section 4 of the FHG (Fachhochschule Studies Act) as amended, according to which the subject-related admission requirement for a Fachhochschule Master's course is a completed University of Applied Sciences Bachelor degree program relevant to the subject or the completion of an equivalent degree program at a recognized domestic or foreign post-secondary educational institution.

1. For the purposes of the present application, Bachelor programs or equivalent post-secondary educational qualifications, particularly in the core subject area of engineering sciences (based on ISCED 2013, Fields of Education and Training 06/071/072), are considered relevant to the subject in question, whereby a total scope of at least 30 ECTS is required. In addition, such degrees should have dealt with contents from the field of economics, such as cost accounting, marketing, business-related administration and management, in summary form in a total of at least 10 ECTS.

2. The FH Kufstein Tirol provides in its course architecture for a networking of the Bachelor and Master's courses in the sense of the Bologna process: Following successful completion of a Bachelor program, graduates have several options for a Master's degree course at and outside the FH Kufstein Tirol. Graduates of the following FH Kufstein Tirol degree programs (irrespective of the organizational form) would be admitted to the present Master's course based on the above-mentioned professional qualifications:

    - Energy and Sustainability Management
    - Facility and Real Estate Management
    - Web Business and Technology
    - Industrial Engineering and Management

3. The languages of instruction and examination at the FH Kufstein Tirol are German and English across all degree programs. Students from non-German speaking countries must therefore provide appropriate evidence of their German language skills.
4. Examining the fulfilment of the admission requirements is the responsibility of the Master's course Smart Products and Solutions course director.