Artificial Intelligence and Data Analytics

MODULE HANDBOOK

Valid from 01.10.2022

Table of Contents

FIRST SEMESTER

Strategic Management

Overall grade weighting	6%	**Semester**	in the first semester
Frequency	Winter term	**Language of instruction**	English
Type of course	Compulsory	**Duration**	1 semester
ECTS-Points	5	**Hours per semester week**	3
Number of participants	Min 10 students, max 30 students		
Mode of delivery	Face-to-face and blended learning		
Responsible for the module	Prof. Dr. Johannes Schmitz		
Teaching methods	Lecture, team work, excercises		
Work parameter	Self-study: 90 hours		
	Contact time: 60 hours		
	Total: 150 hours		
Use for other studies	Joint module with Digital Innovation Management (DIM) and Artificial Intelligence and Data Analytics (AIDA)		
Required competencies			
Admission requirements			
Semester, in which the student must mandatorily registered for the first attempt of examination			

Learning outcome	1) Knowledge Students will have demonstrated knowledge and understanding in the following areas of the field of strategic management: - Baisc terminology and concepts of management accounting and corporate finance as basis - Basic knowledge of underlying theories of performance management - Tools and frameworks for performance measurement and management - Concepts and taxonomies of strategy (e.g. planned strategy, emergent strategy) - Key frameworks and tools for the development and analysis of strategies - Key concepts and frameworks for decision making under uncertainty - Key concepts for strategy implementation in traditional organisations and in agile organisations / start-ups 2) Skills Students will be able to apply their knowledge and understanding of strategic analysis, strategic management as weil as performance measurement and management to different managerial and organizational contexts in particular in the discussion of case studies. They will be able to explain and apply key concepts, frameworks and tools and discuss their value for decision making and organisational development and their limitations. 3) Responsibility and autonomy Students exercise self-management in developing own understanding of the subject by working independently with literature and adapt own behavior to circumstances in solving problems in less defined contexts (e.g. autonomous work on complex case studies).
Learning content	Strategy - Introduction to Strategic Management - Strategy concepts and strategy schools - Tools and Framworks for strategy development and strategic analysis - Introduction to Corporate Strategy and M&A - Strategy implementation - Challenges and opportunities through digitalization - Agile organisations and agile methods Performance measurement - Basic concepts of management accounting and corporate finance - Financial planning & control and responsibility centers - Financial and non-financial performance measurement - Performance measurement and management frameworks and tools - Diagnostic and interactive management control systems - Theoretical foundations of performance measurement, strengths and limitations
Assessment method(s)	Written exam

Recommended or required reading and other learning resources/tools	Anthony, Robert N & Govindarajan, Vijay (2014) "Management Control Systems: European Edition", Mcgraw-Hill Education Simons, Robert (2013) "Performance Measurement and Control Systems for Implementing Strategy - Text and Gases", Pearson Education Limited, New International Edition Mintzberg, Henry/ Lampel, Joseph/ Quinn, James B. (2013) "The Strategy Process", Prentice Hall International, 5th Edition Ries, Eric (2011) "The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses, Penguin Doerr, John (2018) "Measure What Matters: OKRs: The Simple Idea that Drives 1 0x Growth", Portfolio Penguin
Additional (module) information	

Document version	1.0	**Document date**	03.08.2022
Document created by	Prof. Dr. Johannes Schmitz	**Valid from**	01.09.2022
Updated		**by**	

FIRST SEMESTER

Digital Process Management

Overall grade weighting	6%	**Semester**	in the first semester
Frequency	Winter term	**Language of instruction**	English
Type of course	Compulsory	**Duration**	1 semester
ECTS-Points	5	**Hours per semester week**	3
Number of participants	Min 10 students, max 30 students		
Mode of delivery	Face-to-face and blended learning		
Responsible for the module	Prof. Dr. Joerg-Oliver Vogt		
Teaching methods	Lecture, excercises, case studies, group presentations		
Work parameter	Self-study: 90 hours		
	Contact time: 60 hours		
	Total: 150 hours		
Use for other studies	Usable for students of information systems and business administration programs		
Required competencies	Basic knowledge on the subject of process management, fundamentional knowlege on the subject of business administration and management.		
Admission requirements			
Semester, in which the student must mandatorily registered for the first attempt of examination			

Learning outcome	Considering the program's objective to qualify students for enabling enterprises to exploit potentials of existing information system and realize new ways of using information and information technology strategically, this module provides the fundamental knowledge to understand why active process management ist necessary and digitalization is a lever to improve business processes. It ist shown how processes can be digitialized and managed digitally. As to that, the course also provides methods of process management like process modelling techniques and performance analysis. The focus, hovwever, is on conveying insights into theories and state-of-the art methods related to streamline and digitalize business processes and manage them across the lifecycle using state-of-the art tools. 1) Knowledge outcomes Students will have a broad and deep understanding of the scientific foundations, methodologies and fields of application of different approaches to digital process management. Students will gain knowledge on how to model and analyze complex process structures using established modelling and analysis techniques, will learn about their strengths and weaknesses as well as how process models can be translated into IT architectures. Technical-methodical competences - understand the challenges of digitalisation for companies and the related effects on the design of business processes. - explain the influences of digitalisation on business processes in general and the concrete effects on functional areas such as marketing, human resources, logistics and production and on different industries. - Understand business process management as a central management task. - identify, record, describe and represent or model business processes. - Analyse business processes with suitable methods and make suggestions for improvement. - Assess business processes and recognise which activities are necessary for the digitalisation of the process. - to explain advantages and disadvantages of different methods of business process modelling. - to apply selected methods and approaches of business process management (especially EPK and BPMN) and information modelling to concrete case studies from practice. - recognise the appropriate method for problem solving and decision making in the field of business process management and select suitable tools. 2) Skills Students will be able to explain, apply and examine the basics, success factors, principles and methods of effective digital process management in different contexts and industries, particularly enhanced business process modelling (BPMN), analysis (BPMN, process mining) and optimization supported by digital technologies (process execution management, robotic process automation, workflow management systems) and monitoring/controlling (process mining) Students can model, analyse and question business processes in different contexts and levels (operational, strategic) using the methods, instruments and information systems they have learned. They can evalute opportunities and challenges of digitalization for process performance using the tools and methods listed above. 3) Responsibility and autonomy Students can discuss interpersonal issues to be dealt with in smaller project groups, especially in the exercise units. The students recognize the

	challenges and interdependencies of business process management and can reflect on their responsibilities related to making decisions in uncertain and ambiguous contexts with incomplete or limited information. They have developed the ability to evaluate new information, to question existing assumptions, to integrate new knowledge into their models of thinking and to develop independent contributions to practical and theoretical discourse and related solutions.
Learning content	Theories, methodologies and fields of application of different approaches to digital process management as well as related information systems, particularly - Process identification - Enhanced process modelling (BPMN) - Process discovery and analysis (qualitative approaches, process mining) - Process redesign and digitalization (workflow systems, RPA, workflow management systems) - Translating process models into IT architectures - Process monitoring (execution management systems) - Process lifecycle management - Challenges related to digital process management Theoretical knowledge is beeing applied in case studies and other (hands-on) exercises
Assessment method(s)	Portfolio exam
Recommended or required reading and other learning resources/tools	Main Source: Marlon Dumas, Marcello La Rosa, Jan Mendling, Hajo A. Reijers: Fundamentals of Business Process Management, Springer 2018 Recommended: Wil van der Aalst, Process Mining - Data Science in Action Second Edition, Springer 2016 Other papers and cases will be provided in the couse sessions
Additional (module) information	

Document version	1.0	**Document date**	29.08.2022
Document created by	Prof. Dr.Joerg-Olver Vogt	**Valid from**	01.10.2022
Updated		**by**	

FIRST SEMESTER

Big Data and AI

Overall grade weighting	6 %	**Semester**	in the first semester
Frequency	Winter term	**Language of instruction**	English
Type of course	Compulsory	**Duration**	1 semester
ECTS-Points	5	**Hours per semester week**	3
Number of participants	Min 10 students, max 30 students		
Mode of delivery	Presence (face-to-face), blended learning		
Responsible for the module	Prof. Dr. Stefan Faußer		
Teaching methods			
Work parameter	Self-study:	90	hours
	Contact time:	60	hours
	Total:	150	hours
Use for other studies	Joint module with Digital Innovation Management (DIM) and Strategic Information Management (SIM)		
Required competencies	Required is a curious mindset, the skills to acquire new knowledge’s and to apply it on practice exercises. Other than this, the student must have completed the following undergraduate courses: Math (linear algebra, analysis and statistics), relational databases and object-oriented programming.		
Admission requirements			
Semester, in which the student must mandatorily registered for the first attempt of examination			

Learning outcome	By completing this module, students will be able to: (1) Knowledge - List, categorize and understand big data terms, - Understand the possibilities and limits of big data and of artificial intelligence and machine learning, - List, categorize and understand machine learning tasks and methods, (2) Skills - Query NoSQL databases, - Select an appropriate database/ data analytics platform dependent on practical use cases, - Implement and apply machine learning methods, - Analyses and interpret results from machine learning outcomes by utilizing suitable metrics, - Select an appropriate machine learning method dependent on practical use cases, (3) Responsibility and autonomy - Learn self-directed, - Assess the own skills and the study progress when working on solutions, - Ask the right questions and reflect on the answers, - Work in teams, supporting each other and to present the results, - Apply time-management efficiently.
Learning content	Big Data is about large unstructured data that stems from social media postings, intelligence coffee machines or images, audio and video recordings. To utilize this valuable data, it is needed to store it appropriately so later analysis on it can be done efficiently. Machine learning is a research subject that focuses on learning from data in order to automate processes in companies and organisations and allows for enabling artificial intelligences. Within this module, following topics are covered: 1) Big Data - Data analytics platforms and data warehousing - Processing of unstructured data - Utilization of NoSQL databases - Data lakes, document-oriented, key-values, in-memory - Comparison with relational DBMS - Real-time processing of streaming data 2) Unsupervised learning - Partitioning and agglomerative clustering - Clustering categorical data - Internal and external cluster validation 3) Supervised learning - Artificial neural networks - Classification metrics 4) Reinforcement learning
Assessment method(s)	Student research project

Recommended or required reading and other learning resources/tools	Andreas Meier and Michael Kaufmann: SQL & NoSQL Databases, 1st edition, Springer (2019) Stuart Russel and Peter Norvig: Artificial Intelligence: A Modern Appoach, 4th edition, Pearson (2020) Trevor Hastie, Robert Tobshirani and Jerome Friedman: The Elements of Statistical Learning, 2nd edition, Springer (2009) Richard S. Sutton and Andrew G. Barto: Reinforcement Learning: An Introduction, 2nd edition, Bradford Books (2018)
Additional (module) information	

Document version	1.0	**Document date**	02.05.2023
Document created by	Prof. Dr. Stefan Faußer	**Valid from**	01.10.2022
Updated		**by**	

FIRST SEMESTER

Enterprise Application Engineering

Overall grade weighting	6%	**Semester**	in the first semester
Frequency	Winter term	**Language of instruction**	English
Type of course	Compulsory	**Duration**	1 semester
ECTS-Points	5	**Hours per semester week**	3
Number of participants	Min 10 students, max 30 students		
Mode of delivery	Face-to-face and blended learning		
Responsible for the module	Prof. Dr. Philipp Brune		
Teaching methods	Seminar Project work (self learning, coaching)		
Work parameter	Self-study:	120	hours
	Contact time:	30	hours
	Total:	150	hours
Use for other studies	Joint module with Digital Innovation Management (DIM) and Strategic Information Management (SIM)		
Required competencies	Ability to develop (simple) applications based on object-oriented programming paradigms in Java Ability to conceptualize and model data-structures and implement these in relational database systems (e.g., MySQL)		
Admission requirements			
Semester, in which the student must mandatorily registered for the first attempt of examination			

Learning outcome

In accordance with the overarching qualification objectives of the degree program, students are familiarized with the planning, design and development of information systems as well as the concepts, methods and tools required for this.

1) Knowledge

Students have understood relevant application architectures, software components and technologies as well as the quality-determining factors of these systems and current quality standards. Students will also be familiar with important software development metrics. In addition, students know design principles that ensure efficient human-machine interaction for enterprise applications.

2) Skills

Students will be able to select and apply contemporary application architectures and perform quality management within a software project by evaluating and ensuring software engineering quality standards and applying the testing process. Students will master techniques of test case specification, test execution, and techniques of test-driven development (TDD). Students will be able to select and apply appropriate metrics.

3) Responsibility and autonomy

Students will be able to establish, participate in, and reflect on their role in projects to develop an enterprise application in a heterogeneous project team.

Learning content

Realistic software development project including UX design and testing of the user interface with a project partner as project work, project teams with different procedure models (sub sequential, agile) with comparison of experiences.

Contents:

- Technical design of enterprise applications
- Quality of software technology
- Metrics of software engineering
- Quality standards
- Roles and principles of a quality manager
- Design principles for enterprise applications
- Human computer interaction and user experience

Assessment method(s)

Portfolio exam (softwar artefact, documentation, presentation)

Recommended or required reading and other learning resources/tools

Ian Sommerville: Software Engineering (9th edition), Addison-Wesley (2010)

Axel van Lamsweerde: Requirements Engineering: From System Goals to UML Models to Software Specifications, Wiley (2011)

Travis Lowdermilk: User-Centered Design: A Developer's Guide to Building User Friendly

Applications, O'Reilly (2013)

Len Bass, Paul Clements, Rick Kazman: Software Architecture in Practice, Addison-Wesley (2012)

Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides: Design Patterns, Addison-Wesley (1994)

Additional (module) information

Document version	1.0	**Document date**	03.08.2022
Document created by	Prof. Dr. Philipp Brune	**Valid from**	01.10.2022
Updated		**by**	

FIRST SEMESTER

Consulting

Overall grade weighting	6%	**Semester**	in the first semester
Frequency	Winter term	**Language of instruction**	English
Type of course	Compulsory	**Duration**	1 semester
ECTS-Points	5	**Hours per semester week**	2
Number of participants	Min 10 students, max 30 students		
Mode of delivery	Face-to-face, blended learning		
Responsible for the module	Prof. Dr. Heiko Gewald		
Teaching methods	Lecture, excercises, workshop, group presentation, practice project, case study		
Work parameter	Self-study: 120 hours		
	Contact time: 30 hours		
	Total: 150 hours		
Use for other studies	Joint module with Digital Innovation Management (DIM) and Strategic Information Management (SIM)		
Required competencies			
Admission requirements			
Semester, in which the student must mandatorily registered for the first attempt of examination			

Learning outcome	Consultants play a big role in todays knowledge economy. Whether the students of this course chose to start a career as consultant or chose a career in a traditional corporate environment, chance that they will have interactions with business and IT consultants are rather high. To prepare students for interactions with consultants or for a career I consultancy, this course provides profund insights into the business of consulting. As project management is at the core of the consulting services, will recap knowledge from previous lectures and discuss the most important concepts. Furthermore, presentation skills (how to structure a presentation and how to present the most important topics) will be discussed. To put this know-how into action, a case study with a consulting firm will be conducted. 1) Knowledge Consulting: - Types of consultancies and the structure of the consulting market - Roles, processes, and hierarchies within a consulting firm Project Management: - Recap of the most important concepts and tasks of project management - How to structure a project Soft Skills: - How to structure a meaningful presentation - How to present with impact 2) Skills - Distinguish different types of firms operating in the management consulting market - Plan a project and define the corresponding roles and tasks - Present findings to a large group 3) Responsibility and autonomy Students apply the knowledge and skills gathered in this course to solve a real-world consulting problem as part of a case study and multi-day workshop with an external Management Consulting firm.
Learning content	This module provides the concepts and tools necessary to deliver a consulting project This includes project organization, problem finding and solution framing, communicating with stakeholders, and presenting the solution in form of a well-crafted presentation. Course Content: - Recap of basic and advanced project management techniques - The market of management consulting firms - Principles of the business of consulting - The process of consulting - Soft skills / presentation techniques - A case study in cooperation with an external consulting firm
Assessment method(s)	Seminar paper and presentation

Recommended or required reading and other learning resources/tools	Contemporary reading material will be updated and distributed each term Recommended: Robert D. Austin: "The Adventures of an IT Leader", Mcgraw-Hill Professional (2009), ISBN 978-1422146606 Recommended: Tom DeMarco: "The Deadline", Computer Bookshops(1997), ISBN 978-0932633392
Additional (module) information	

Document version	1.0	**Document date**	03.08.2022
Document created by	Prof. Dr. Heiko Gewald	**Valid from**	03.08.2022
Updated		**by**	

FIRST SEMESTER

Interpersonal Skills

Overall grade weighting	6%	**Semester**	in the first semester
Frequency	Winter term	**Language of instruction**	English
Type of course	Compulsory	**Duration**	1 semester
ECTS-Points	5	**Hours per semester week**	4
Number of participants	Min 10 students, max 30 students		
Mode of delivery	Face-to-face and blended learning		
Responsible for the module	Prof. Dr. Andy Weeger		
Teaching methods	Lecture Exercises (individually and team-based) Presentations		
Work parameter	Self-study: 90 hours Contact time: 60 hours Total: 150 hours		
Use for other studies	Joint module with Digital Innovation Management (DIM) and Strategic Information Management (SIM)		
Required competencies			
Admission requirements			
Semester, in which the student must mandatorily registered for the first attempt of examination			

Learning outcome	To be prepared for their future roles in cross-functional functions and (leadership) positions in national and international organizations, the students learn to lead themselves and understand and efficiently shape interpersonal interactions and conflicts in organizations. 1) Knowledge Students will have knowledge and understanding of theories explaining interpersonal interaction in business contexts, conflict in organizations and the strategies to resolve it, and self-leadership and teamwork. Students have a deeper understanding of the ethical dimensions of interpersonal communication, the types, rules and styles of business communication, emotional intelligence and self-leadership, resilience (for leaders) and the challenges of (virtual) collaboration within and between disciplines. 2) Skills The students show that they can efficiently lead themselves, that they are able to recognize the characteristics of competent communication, demonstrate the ability to assess the appropriateness and effectiveness of interpersonal strategies and responses based on situational contexts, goals, and human needs, demonstrate effective interpersonal conflict management principles, and that they are able to explain own and others' behavior in various settings. 3) Responsibility and autonomy Students will be able to recognize the ethical dimensions of interpersonal communication, reflect on their interpersonal interactions, conduct themselves with high professional integrity in a variety of contexts, and develop their interpersonal skills largely on their own.
Learning content	Topics in focus - Mindset (a psychology of success) - Culture (sensitivity for cultural differences and methods to get along) - Career (designing career paths, getting so good you will not be ignored) - Productivity (building good habits, time management, focus) - Change (storytelling, (inter-)personal change management) - Reselience (coping with failure) - Communication (feedback, effective use of communication types, handling conflict) - Collaboration (methods, tools, measures) - Online collaboration - Happiness Theoretical foundations, such as - Self-concept theory - Emotional intelligence - Self empathy - Mindset
Assessment method(s)	Presentation

Recommended or required reading and other learning resources/tools	A detailed list of relevant literature can be found in the teaching materials per unit, including, but not limited to: Dweck, Carol S.. Mindset: The New Psychology of Success. USA, Random House Publishing Group, 2006. Scott, Kim. Radical Candor: Fully Revised & Updated Edition: Be a Kick-Ass Boss Without Losing Your Humanity. USA, St. Martin's Publishing Group, 2019. Eyal, Nir, and Li-Eyal, Julie. Indistractable: How to Control Your Attention and Choose Your Life. USA, BenBella Books, 2019. Doerr, John. Measure What Matters: How Google, Bono, and the Gates Foundation Rock the World with OKRs. USA, Penguin Publishing Group, 2018.
Additional (module) information	

Document version	1.0	**Document date**	03.08.2022
Document created by	Prof. Dr. Andy Weeger	**Valid from**	03.08.2022
Updated		**by**	

SECOND SEMESTER

Business Application Re-Engineering

Overall grade weighting	6 %	**Semester**	in the second semester
Frequency	each semester	**Language of instruction**	English
Type of course	Compulsory	**Duration**	1 semester
ECTS-Points	5	**Hours per semester week**	**3**
Number of participants	Min 10 students, max 30 students		
Mode of delivery	Online, self-study		
Responsible for the module	Prof. Dr. Philipp Brune		
Teaching methods	Exercises for self-study, Learning-Videos, Quizzes, Assignments Pure online course deliverd by VHB		
Work parameter	Self-study: 150 hours		
	Contact time: 0 hours		
	Total: 150 hours		
Use for other studies	Elective for SIM		
Required competencies	Only the basic knowledge of programming, software engineering and computer architecture, as usually taught in relevant undergraduate or graduate courses, is assumed as prior knowledge.		
Admission requirements			
Semester, in which the student must mandatorily registered for the first attempt of examination			

Learning outcome	Students will be - able to deepen their existing expertise in computer science and information technology with regard to the requirements and relevant technologies of enterprise computing and digital transformation, - understand, evaluate and be able to apply the issues/challenges as well as the different aspects and approaches of modernizing legacy applications in an enterprise context, - understand, evaluate and be able to use traditional and new approaches(Blockchain, DLT) for online transaction processing (OLTP) as well as the underlying processes and technologies, - understand and be able to apply possibilities, concepts and technologies for the implementation and operation of modern mobile or web-based front-ends (systems of engagement) for existing applications. - understand, evaluate and be able to use virtualization and container technologies for the operation of enterprise applications, especially with regard to IT security, - understand and be able to apply the organization and methods of traditional on-premise IT operations in the enterprise, in comparison, understand, analyze and be able to evaluate the similarities and differences as well as advantages and disadvantages of cloud-based IT infrastructures, - understand and be able to practically use methods and tools for building and operating cloud-based IT services and migrating applications to them, - understand and be able to apply Agile methods such as Scrum or Kanban, and the DevOps approach in the context of enterprise applications and legacy systems in particular.

Learning content	Legacy Problems and Application Modernization Legacy Systems Re-Hosting vs. Modernization Application Understanding and Asset Analysis Application Modernization by Migration Mainframes Code Conversion Refactoring Binary Evulation Testing Transaction Processing and Application Modernization Distributed Transactions and CICS Distributed Ledger Technology (DLT) and Blockchains System of Record vs. Systems of Engagement Web and Mobile Frontends Web Services Containers and Microservices Containers vs. virtual Machines Docker Kubernetes OpenShift Microservices Kata Container gVisor Firecracker Mainframe Anetsto Webservices Architecture Patterns IT Application Operations Cloud Computing Cloud Management Security and Data Protection Encryption of Cloud Services Agility and Scrum DevOps
Assessment method(s)	Written Examination of approx. 90 minutes if more than 20 students register for the Examination otherwise, oral of approx. 30 minutes.
Recommended or required reading and other learning resources/tools	Craig S Mullins. 2020.The Mainframe Is a Modern Platform, Database Trends and Applications, 2020-02-01,Inc ISSN: 1547-9897 Paul Bobak. 2017. “Digital Transformation Economy”: Modernizing Core Technology Architectures is Critical. Database Trends and Applications, 2017-14-08,ISSN: 1547-9897 Sastry KVSN and Ambadas Choudhari. 2013. Legacy mainframe back-ends supporting new age enterprise applications: can the elephant run with deer’s? In Proceedings of the 6th India Software Engineering Conference (ISEC '13). Association for Computing Machinery, New York, NY, USA,
Additional (module) information	

Document version	1.0	**Document date**	19.04.2023
Document created by	Prof. Dr. Philipp Brune	**Valid from**	01.10.2022
Updated		**by**	

SECOND SEMESTER

Business Value Creation by IT

Overall grade weighting	6%	**Semester**	in the second semester
Frequency	Summer term	**Language of instruction**	English
Type of course	Compulsory	**Duration**	1 semester
ECTS-Points	5	**Hours per semester week**	2
Number of participants	Min 10 students, max 30 students		
Mode of delivery	Face-to-face and blended learning		
Responsible for the module	Prof. Dr. Andy Weeger		
Teaching methods	Lectures, practice project, presentations, coaching		
Work parameter	Self-study: 120 hours		
	Contact time: 30 hours		
	Total: 150 hours		
Use for other studies	Joint module with Digital Innovation Management (DIM) and Strategic Information Management (SIM)		
Required competencies			
Admission requirements			
Semester, in which the student must mandatorily registered for the first attempt of examination			

Learning outcome	In this module, the theoretical knowledge and competencies in information and IT management acquired and deepened in the first semester are applied and further extended by means of executing a real-world project focusing on developing a technological artefact that creates value for a specific company (e.g., prototype for a new product, process improvements, decision-making support). As the project is intended to involve numerous stakeholders, students apply their competencies in structuring problems at strategic and operational level, communicating with diverse stakeholders, and orchestrating activities to come to an acceptable project result. 1) Knowledge The students will have enhanced knowledge of the mechanisms of how IT creates business value and how such solutions can be conceptualized, designed and implemented in a practical context. The students will understand the challenges of specific practical settings and how to transfer and adapt insights they learned in various modules. In addition, students will deepen their methodological knowledge regarding project procedures. 2) Skills Students can apply and contextualize their knowledge and understanding of disruptive technologies within a specific organizational setting and demonstrate problem-solving skills to analyze specificities and complexities of different project contexts. Students will be able to communicate their conclusions and the underlying knowledge and reasoning clearly and unambiguously to project sponsors. 3) Responsibility and autonomy Students can reflect on their social and ethical responsibilities and make responsible decisions with incomplete or limited information in project contexts with typically unstructured tasks, multiple stakeholders, and diverging interests. They will be able to autonomously acquire new knowledge and skills, and independently perform application-oriented innovation projects.

Learning content	In accordance with the program's qualification goals regarding designing, implementing, managing and communicating innovative IT that creates business value, this module offers students the possibility to put into practice, what they learned in the courses of the first semester and supports understanding as well as transfer of topics teached in the second semester. As to that, core concepts and related methods such as - (customer) need identification (e.g., design thinking) - generating and developing ideas - sources and characteristics of business value - key aspects of (digital) innovations - challenges in implementing digital innovations (change, adoption & use) - capturing and measuring value from IT/digital innovations are being teached. Furthermore, enhanced methods that build on the contents of the first semester concerning development of IT solutions and project organization, problem finding and solution, communicating with stakeholders, and presenting the solution in form of a pitch as well as documenting results in a structured way are touched during coaching sessions. The project topic(s) will be announced at the beginning of the semester.
Assessment method(s)	Seminar paper and presentation
Recommended or required reading and other learning resources/tools	Tidd, J., & Bessant, J. R. (2020). Managing innovation: integrating technological, market and organizational change. John Wiley & Sons. Newell, Sue; Morton, Josh; Marabelli, Marco, and Galliers, Robert: Managing Digital Innovation: A Knowledge Perspective - Red Globe Press, 2020. Nambisan, Satish; Lyytinen, Kalle, and Yoo, Youngjin: Handbook of Digital Innovation, Edward Elgar Publishing, 2020. Required project-related reading will be updated and distributed each term
Additional (module) information	

Document version	1.0	**Document date**	03.08.2022
Document created by	Prof. Dr. Andy Weeger	**Valid from**	03.08.2022
Updated		**by**	

SECOND SEMESTER

Advanced NLP

Overall grade weighting	6%	**Semester**	in the second semester
Frequency	Summer term	**Language of instruction**	English
Type of course	Compulsory	**Duration**	1 semester
ECTS-Points	5	**Hours per semester week**	3
Number of participants	Min 15 students, max 35 students		
Mode of delivery	Blended learning (self-study, online, in-presence), exercises		
Responsible for the module	Prof. Dr. Philipp Brune		
Teaching methods	Lecture, Team work, Exercises		
Work parameter	Self-study: 120 hours		
	Contact time: 30 hours		
	Total: 150 hours		
Use for other studies	Joint module with Digital Innovation Management (DIM) and Strategic Information Management (SIM)		
Required competencies	Programming Skills in Java and Python Fundamentals of DBMS and Data Science Fundamentals of Big Data, Machine and Deep Learning		
Admission requirements			
Semester, in which the student must mandatorily registered for the first attempt of examination			

Learning outcome	(1) - Know and understand the fundamental concepts and challenges of Natural Language Processing (NLP) - Know and understand the concepts of modern NLP such as word embedding's, Word2Vec, large language models, transformer architectures etc. (2) – Use and apply established NLP tools and frameworks to implement basic NLP processing operations by example – Implementing LLM and GPT algorithms and example applications by using established and open tools and frameworks (3) - Critically reflect the outcomes of AI NLP applications and their impact on society, businesses and the individual situation of the student - Extend self-guided learning skills - Extend academic reading and analytical skills - Extend professional team working and intercultural skills
Learning content	Fundamental concepts of NLP (Tokenization, Lemmtization, POS & Morphological Tagging, Named-Entity-Recognition, Dependency Parsing) Language Models Word Embedding's Word2Vec Algorithm Encoder/Decoder-Architectures Transformer-Architectures Attention Mechanisms Large Language Models (LLM) and GPT Hybrid approaches combining LLM with symbolic AI approaches Applications of NLP and their critical evaluation
Assessment method(s)	Project assignment, presentation, oral exam
Recommended or required reading and other learning resources/tools	Liddy, E.D. 2001. Natural Language Processing. In Encyclopedia of Library and Information Science, 2nd Ed. NY. Marcel Decker, Inc. Eisenstein, J. (2019). Introduction to natural language processing. MIT Press. Peng Qi, Yuhao Zhang, Yuhui Zhang, Jason Bolton and Christopher D. Manning (2020). Stanza: A Python Natural Language Processing Toolkit for Many Human Languages. In Association
Additional (module) information	

Document version	1.0	**Document date**	28.04.2023
Document created by	Prof. Dr. Philipp Brune	**Valid from**	01.10.2022
Updated		**by**	

SECOND SEMESTER

Deep Learning

Overall grade weighting	6 %	**Semester**	in the second semester
Frequency	Summer term	**Language of instruction**	English
Type of course	Compulsory	**Duration**	1 semester
ECTS-Points	5	**Hours per semester week**	3
Number of participants	Min 10 students, max 30 students		
Mode of delivery	Presence (face-to-face)		
Responsible for the module	Prof. Dr. Stefan Faußer		
Teaching methods	Lecture, Practice exercises, Group work in the computer lab		
Work parameter	Self-study: 90 hours		
	Contact time: 60 hours		
	Total: 150 hours		
Use for other studies	Joint module with Digital Innovation Management (DIM) and Strategic Information Management (SIM)		
Required competencies	Required is a curious mindset, the skills to acquire new knowledge's and to apply it on practice exercises. Other than this, the student must have completed the following undergraduate courses: Math (linear algebra, analysis and statistics), relational databases and object-oriented programming.		
Admission requirements			
Semester, in which the student must mandatorily registered for the first attempt of examination			

Learning outcome	By completing this module, students will be able to: (1) Knowledge - List, categorize and understand deep learning tasks and methods, - Understand the possibilities and limits of deep learning, - Know where to look for new scientific articles in the area of machine learning/ deep learning (2) Skills - Implement and apply deep learning methods with fundamental state-of-the art deep learning libraries, - Analyses, interpret and explain results from deep learning outcomes, - Apply the knowledge's of new scientific articles in the machine learning/ deep learning domain to overcome deep learning problems - Select an appropriate deep learning method dependent on practical use cases, (3) Responsibility and autonomy - Learn self-directed, - Assess the own skills and the study progress when working on solutions, - Ask the right questions and reflect on the answers, - Work in teams, supporting each other and to present the results, - Apply time-management efficiently.
Learning content	Deep learning, a novel part of machine learning, essentially includes deep artificial neural networks that are able to recognize and utilize complex patterns in large data sets. This allows to even accomplishing some tasks that previously only humans were capable to do. Examples are to recognize objects in images or emotions in speech. The outline of this course is as follows: 1) Image classification, image segmentation and object detection with convolutional neural networks 2) Deep learning for small data: Transfer learning, one-shot learning 3) Sequence models with recurrent neural networks and transformers 4) Explainable deep learning 5) Generative models
Assessment method(s)	Written exam
Recommended or required reading and other learning resources/tools	Ian Goodfellow, Yoshua Bengio and Aaron Courville: Deep Learning, MIT Press (2016) Francis Chollet: Deep Learning with Python, Manning (2017) Stuart Russel and Peter Norvig: Artificial Intelligence: A Modern Appoach, 4th edition, Pearson (2020) McKinney, Python for Data Analysis, 1st edition, O'Reilly (2012)
Additional (module) information	

Document version	1.0	**Document date**	02.05.2023
Document created by	Prof. Dr. Stefan Faußer	**Valid from**	01.10.2022
Updated		**by**	

SECOND SEMESTER

Data Platform Architectures

Overall grade weighting	6 %	**Semester**	in the second semester
Frequency	Summer term	**Language of instruction**	English
Type of course	Compulsory	**Duration**	1 semester
ECTS-Points	5	**Hours per semester week**	3
Number of participants	Min 10 students, max 30 students		
Mode of delivery	Blended learning, in presence exercise		
Responsible for the module	Prof. Dr. Philipp Brune		
Teaching methods	Lecture Group Presentations Practical realisation		
Work parameter	Self-study:	120	Hours
	Contact time:	30	hours
	Total:	150	hours
Use for other studies	Elective for SIM		
Required competencies	Programming Skills in Java and Python Fundamentals of DBMS and Data Structures		
Admission requirements			
Semester, in which the student must mandatorily registered for the first attempt of examination			

Learning outcome	(1) - Know and understand the fundamental definitions in the field of data platforms - Know and understand the characteristics of data platforms and distinguish between different types - Know and understand the structure of data platforms (2) - Use and apply established data platform tools to implement basic operations on different components of a data platform - Implement single parts of a data platform using various established and open tools and frameworks - Implement a data platform by merging the individual components (3) - Extend self-guided learning skills - Extend academic reading and analytical skills - Extend professional team working and intercultural skills
Learning content	**Basics Part 1** a. Organizational b. Big Data c. Data Platforms and Layers **Basics Part 2** Characteristics and Types of Good Data Platforms **Tools Applications Part 1** AWS Lake & Hadoop Essentials **Student Presentations** **Tools Applications Part 2** Hadoop (HDFS & MapReduce), …, NoSQL Database Tools
Assessment method(s)	Examination: Portfolio Exam (presentation, 20 – 30 min. per student and oral exam, 30 min.)

Recommended or required reading and other learning resources/tools	T. Hlupić and J. Puniš, "An Overview of Current Trends in Data Ingestion and Integration," 2021 44th International Convention on Information, Communication and Electronic Technology (MIPRO), Opatija, Croatia, 2021, pp. 1265-1270, doi: 10.23919/MIPRO52101.2021.9597149 Venkatraman, Sitalakshmi, et al. "SQL versus NoSQL movement with big data analytics." International Journal of Information Technology and Computer Science 8.12 (2016): 59-66 H. Mehmood et al., "Implementing Big Data Lake for Heterogeneous Data Sources," 2019 IEEE 35th International Conference on Data Engineering Workshops (ICDEW), Macao, China, 2019, pp. 37-44, doi: 10.1109/ICDEW.2019.00-37 Ajah, I.A.; Nweke, H.F. “Big Data and Business Analytics: Trends, Platforms, Success Factors and Applications.” Big Data Cogn. Comput. 2019, 3, 32. https://doi.org/10.3390/bdcc3020032 Kolajo, Taiwo, Olawande Daramola, and Ayodele Adebiyi. "Big data stream analysis: a systematic literature review." Journal of Big Data 6.1 (2019): 47. Alwidian, Jaber, et al. "Big Data Ingestion and Preparation Tools." Modern Applied Science 14.9 (2020): 12-27 Mrabet, Hichem, et al. "A survey of IoT security based on a layered architecture of sensing and data analysis." Sensors 20.13 (2020): 3625 Ardagna, Claudio A., et al. "Big Data Analytics-as-a-Service: Bridging the gap between security experts and data scientists." Computers & Electrical Engineering 93 (2021): 107215 Alouffi, Bader, et al. "A systematic literature review on cloud computing security: threats and mitigation strategies." IEEE Access 9 (2021): 57792-57807 https://www.udemy.com/course/big-data-and-hadoop-essentials-free-tutorial/ https://courses.bigdatainrealworld.com/p/developer

Additional (module) information	

Document version	1.0	**Document date**	28.04.2023
Document created by	Prof. Dr. Philipp Brune	**Valid from**	01.10.2022
Updated		**by**	

THIRD SEMESTER

Academic Writing

Overall grade weighting	6%	**Semester**	in the third semester
Frequency	Winter term	**Language of instruction**	English
Type of course	Compulsory	**Duration**	1 semester
ECTS-Points	5	**Hours per semester week**	4
Number of participants	Min 10 students, max 30 students		
Mode of delivery	Face-to-face and blended learning		
Responsible for the module	Prof. Dr. Andy Weeger		
Teaching methods	Lecture Exercises (reading and discussions) Coaching		
Work parameter	Self-study: 90 hours		
	Contact time: 60 hours		
	Total: 150 hours		
Use for other studies	Joint module with Digital Innovation Management (DIM) and Strategic Information Management (SIM)		
Required competencies			
Admission requirements			
Semester, in which the student must mandatorily registered for the first attempt of examination			

Learning outcome	Considering the program's objective to qualify students for coodinating and cross-functional functions and positions in national and international organizations, to use diverse sources of information which includes academic as well as practitioner literature, and to communicate with diverse stakeholders, this module focuses on competencies needed to argue stringently, develop academic texts, and communciate in English. 1) Knowledge The students have demonstrated understanding and knowledge of key techniques, guidelines, elements, structures, vocabulary and language, and formal requirements of academic written communication, particularly in the field of management and information system research. 2) Skills The students are able to draft, organize, and revise scientific texts that are coherent, clear, and concise with appropriate use of citations and can be printed in a journal or conference proceedings. Students can master all necessary writting communication in a peer-review process (as author or as reviewer). Students are able to effectively use tools to support the writing process (e.g., Citation Management Systems). 3) Responsibility and autonomy Students can master the challenge of building on work done by others and create something original from it, while maintaining academic integrity and uphold the standards of good academic work.
Learning content	In accordance with the program's qualification goals to enable students to use academic sources, and write own research papers, this module provides a deepening and practicing of what has been learned in IS research. Further, it provides English writing training. Writing process and strategy (e.g., research, planning, summarizing, organizing, plagiarism, referencing, proofreading). Elements of writing (e.g., argument and discussion, cause and effect, definitions, style) Writing vocabulary and language (e.g., precision, clarity, conciseness, scientific vocabulary) Structure of a academic paper (e.g., outline of the document, transition, implementation and presentation of data) Review process (e.g., writing a review, writing a response to the reviewer letter) Ongoing language coaching for own project
Assessment method(s)	Portfolio exam (multiple assignments)
Recommended or required reading and other learning resources/tools	A number of research papers to be distributed at beginning of the course Recker, Jan. Scientific research in information systems: a beginner's guide. Springer Science & Business Media, 2012. Macgilchrist, Felicitas. Academic writing. Verlag Ferdinand Schöningh, Paderborn, 2014.
Additional (module) information	

Document version	1.0	**Document date**	03.08.2022
Document created by	Prof. Dr. Andy Weeger	**Valid from**	03.08.2022
Updated		**by**	

THIRD SEMESTER

Information Systems Research

Overall grade weighting	6%	**Semester**	in the third semester
Frequency	Winter term	**Language of instruction**	English
Type of course	Compulsory	**Duration**	1 semester
ECTS-Points	5	**Hours per semester week**	2
Number of participants	Min 10 students, max 30 students		
Mode of delivery	Face-to-face and blended learning		
Responsible for the module	Prof. Dr. Andy Weeger		
Teaching methods	Lecture, excercises, group presentations		
Work parameter	Self-study: 120 hours		
	Contact time: 30 hours		
	Total: 150 hours		
Use for other studies	Joint module with Digital Innovation Management (DIM) and Strategic Information Management (SIM)		
Required competencies			
Admission requirements			
Semester, in which the student must mandatorily registered for the first attempt of examination			

Learning outcome	Considering the program's objective to qualify students for an academic career, this module focuses on methodological competencies and writing skills needed to craft academic texts and perform research projects. 1) Knowledge Students can: - demonstrate knowledge of the concepts and different research methods - distinguish different approaches to theory building - elaborate on the advantages and disadvantages of different data acquisition methods - understand the structure of a scientific paper and the corresponding presentation 2) Skills The students are able, based on the knowledge acquired in this course to. - formulate a valid research question - choose the correct research method to answer the research question - apply the correct data gathering method - use the correct statistical method or corresponding qualitative method to analyze their findings - formulate implications for theory and practice 3) Responsibility and autonomy Students apply the knowledge and skills gathered in this course to write a scientific paper or fractions of it and present it to the class
Learning content	In accordance with the program's qualification goals to enable students to use academic sources, carry-out research projects, and analytically write own papers, this module provides methodological foundations as well as guidelines to structure a problem and craft a consistent paper that provides a logical thread. - Theory of science - Basic principles of research (in IS) - Research process - Theory - Research methods (quantitative, qualitative, design science) - Writing IS articles As well as deep dives into, e.g., - Structured equation modelling (SEM) - Structured literature review
Assessment method(s)	Seminar paper

Recommended or required reading and other learning resources/tools	Dwivedi, Y. K., Wade, M. R., Schneberger, S. L.: Information Systems Theory - Explaining and Predicting Our Digital Society (Vol. 1 + 2), Springer, 2011. Hevner A., Chatterjee, S.: Design Research in Information Systems: Theory and Practice, Springer, 2010. Recker, J: Scientific Research in Information Systems: A Beginner's Guide. Springer Science & Business Media, 2012. Yin, R. K.: Qualitative Research from Start to Finish, Guilford, 2010 Additional reading will be updated and distributed each term
Additional (module) information	

Document version	1.0	**Document date**	03.08.2022
Document created by	Prof. Dr. Andy Weeger	**Valid from**	03.08.2022
Updated		**by**	

THIRD SEMESTER

Master Seminar

Overall grade weighting	2%	**Semester**	in the third semester
Frequency	Winter term	**Language of instruction**	English
Type of course	Compulsory	**Duration**	1 semester
ECTS-Points	2	**Hours per semester week**	2
Number of participants	Min 10 students, max 30 students		
Mode of delivery	Face-to-face		
Responsible for the module	Prof. Dr. Andy Weeger		
Teaching methods	Lecture, coachings		
Work parameter	Self-study: 30 hours Contact time: 30 hours Total: 60 hours		
Use for other studies			
Required competencies			
Admission requirements	Passed modules of the study programme's first and second semester		
Semester, in which the student must mandatorily registered for the first attempt of examination			
Learning outcome	1) Knowledge Students will have demonstrated knowledge and understanding in the following areas: - Critical evaluation of work of others and own work in terms of quality - Creation of logically structured presentation 2) Skills Students will be able to provide constructive criticism and receive feedback from others. They will also be able to evaluate, and reflect on knowledge from diverse sources and build on it to create own onsiderations. 3) Responsibility and autonomy Students will be able to autonomously formulate theoretical considerations, pinpoint potential limitations, and put forth ideas for future research. They will also be able to consider social and ethical implications oftheir and others work.		

Learning content	During this module, the student gets individual coaching reagrding his research and defends his or her thesis with a presentation and following discussion.
Assessment method(s)	Presentation
Recommended or required reading and other learning resources/tools	Recker, J: Scientific Research in Information Systems: A Beginner's Guide. Springer Science & Business Media, 2012.
Additional (module) information	

Document version	1.0	**Document date**	03.08.2022
Document created by	Prof. Dr. Andy Weeger	**Valid from**	03.08.2022
Updated		**by**	

THIRD SEMESTER

Master Thesis

Overall grade weighting	20%	**Semester**	in the third semester
Frequency	Winter term	**Language of instruction**	English
Type of course	Compulsory	**Duration**	1 semester
ECTS-Points	18	**Hours per semester week**	0
Number of participants	Min 10 students, max 30 students		
Mode of delivery	Face-to-face		
Responsible for the module	Prof. Dr. Andy Weeger		
Teaching methods	Coaching during the seminars (see module Master Seminar)		
Work parameter	Self-study: 540 hours		
	Contact time: 0 hours		
	Total: 540 hours		
Use for other studies			
Required competencies			
Admission requirements	Passed modules of the study programme's first and second semester		
Semester, in which the student must mandatorily registered for the first attempt of examination			

Learning outcome	1) Knowledge Students will have demonstrated knowledge and understanding in the following areas: - Research strategies, research designs, methods and approaches, and quality criteria in research in information systems - Critical evaluation of work of others in terms of quality - Creation of logically structured own research paper 2) Skills Students will be able to independently create scientific work and to evaluate, and integrate knowledge from diverse sources and build on it to create own scientific output. 3) Responsibility and autonomy Students will be able to autonomously formulate and justify own research topics, acquire knowledge from extant research, and independently perform research-oriented projects. They will also be able to responsibly deal with empirical information acquired from various stakeholders and to consider social and ethical implications of their work.
Learning content	The Master Thesis shall exhibit the student's competencies and abilities to research, solve and critically discuss a current topic of the field information systems, particularly information and IT management. The students have to meet formal and content standards and have to organize their work load to finish in a specific time frame. Significant practical contributions are desireable.
Assessment method(s)	Master Thesis
Recommended or required reading and other learning resources/tools	Dwivedi, Y. K., Wade, M. R., Schneberger, S. L.: Information Systems Theory - Explaining and Predicting Our Digital Society (Vol. 1 + 2), Springer, 2011. Recker, J: Scientific Research in Information Systems: A Beginner's Guide. Springer Science & Business Media, 2012.
Additional (module) information	

Document version	1.0	**Document date**	03.08.2022
Document created by	Prof. Dr. Andy Weeger	**Valid from**	03.08.2022
Updated		**by**	