Study regulations of the
FH Master's course

Data Science & Intelligent Analytics

To obtain the academic degree

Master of Science in Engineering
Abbreviated MSc

as an appendix to the statutes of the FH Kufstein Tirol

Organizational form: full-time
Duration: 4 semesters
Scope: 120 ECTS
Places for beginners per academic year: 25

Version 1
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Start with study year 2025/26

Content

1 OCCUPATIONAL PROFILES

1.1 Occupational fields

Graduates of the master's degree program in Data Science & Intelligent Analytics can essentially work in all industries that relate to data collection, data storage, data analysis, or the utilization of data. However, thanks to their broad education, graduates are particularly sought-after employees and managers in the following core occupational fields:

- IT, particularly in the areas of data analysis and utilization
- IT consulting, particularly in the areas of data analysis and utilization
- Predictive analysis in various sub-fields, among others:
    - Consumer and process-oriented data processing
    - Data processing in the field of sensor data (e.g., Internet of Things)
    - Evaluation of data in the context of scientific research
- Preparation and presentation of data and analysis of results
- Development of strategic use cases for data utilization
- Interpretation of data analyses and use cases regarding ethical, compliance, and legal implications

Due to the increasing importance of data in the age of digitization and the associated growing demand for specialists to collect, store, evaluate, and use data, graduates can enter a wide variety of institutions and types of companies. These include large companies at both the national and international levels, as well as small and medium-sized enterprises and organizations in the sphere of governments and NGOs.

The main characteristics of the occupational fields are:

1. A requirement for professionals to possess a **high level of understanding of the technical background, methods, and tools** of data analysis, which can have a high degree of complexity.
2. A requirement for professionals to be capable of a **high degree of flexibility in the application of these methods and tools** in different organizational contexts, which is achieved through a wide range of knowledge in the IT context as well as in the context of application.

After an induction phase, graduates of this degree program are also able to take on (in addition to the listed operational activities) managerial and supervisory roles in the areas of data collection, storage, analysis, and use. Below, typical occupational profiles are listed as examples. These job profiles deliberately cover a very broad spectrum in order to illustrate that graduates of the master's degree program can gain a foothold in very different fields depending on their specialization and previous experience. The master's degree program itself provides a sound education that focuses on all the activities described, which are outlined following the data life cycle.

Data Application Developer

Data Application Developers are proficient in the development of data-driven systems, develop corresponding tools and processing chains (also known as "toolchains"), and understand how these operate. Their focus is on practical development work. In their work, these professionals build on already defined software interfaces and concentrate on the data pipeline between the output and input interfaces of corresponding software systems. They can, therefore, focus on the performance and scalability of these applications. They work primarily at the operational level and are usually detached from specific application domains. However, they may specialize in certain methods/techniques of data evaluation.

This job description includes the following tasks:

- Develop data-driven systems
- Develop toolchains
- Develop data-driven components for existing systems
- Develop analysis pipelines based on existing interfaces (APIs)

Data Engineer

Data Engineers are experts in software engineering (i.e., the design of software) in the field of data-driven systems and design architectures for data processing, such as toolchains and storage systems. They pay attention to the architecture on the one hand, but also to the scalability of the applications for processing large amounts of data on the other. Their work focuses on the implementation of methods and techniques for the holistic integration of data and its use within the systemic landscape. In the course of this work, these professionals work primarily at the operational level and are often detached from a specific technical domain. However, they may specialize in certain methods/techniques of data evaluation.

This job description includes the following tasks:

- Design strategies for data integration within an organization
- Design strategies for the implementation of data evaluation in systems
- Design scalable analysis systems and system landscapes
- Support data-driven applications in the areas of requirements management (change control) and operations

Big Data & Business Intelligence Consultant

Big Data & Business Intelligence Consultants offer consulting services that focus in particular on the collection, storage, analysis, and/or use of data. These professionals are particularly active at the middle and upper (strategic) management levels. They have extensive knowledge of tools and methods, as well as a good overview of common data science practices.

This job description includes the following tasks:

- Advise clients on the conception of data-driven strategies
- Support clients in the implementation of data-driven strategies
- Advise clients on the purchase of new systems
- Advise clients on the development of data-driven business models
- Carry out an initial analysis following the concept of a Data Value Check

Senior Data Scientist

Senior Data Scientists work on tasks related to data analysis, business intelligence, and data-driven applications, including the collection, storage, analysis, and/or use of data. In this role, these professionals have a strong relationship with the respective application domains in which they work. As a result, they achieve a higher level of domain-specificity in their work than traditional Data Application Developers or Data Engineers, for example. Their core tasks are at the operational and management levels. They also counsel management at the strategic level in relation to data-related decisions. As a result, these professionals need to possess a broad range of knowledge in the field of data-driven applications. They also take on the role of technology scouts in the area of data-driven applications and thus drive forward related developments within their companies.

This job description includes the following tasks:

- Prepare strategic decisions and develop strategic options
- Develop data-driven business models with a view to the respective domain of application
- Analyze company data for various departments
- Advise specialist departments on handling data
- Operate technology and method scouting
- Advise specialist departments with regard to the compliance of products/projects and with regard to data protection

Data Science Team Manager

Data Science Team Managers coordinate in-house projects or organizational units that focus on the collection, storage, analysis, and/or use of data. The combination of technical knowledge in the field of data science with management and leadership skills is at the forefront of their daily work. In this role, these professionals work primarily at the management and strategic levels and often act as the interface with other specialist areas. Some of the tasks require skills that can be developed after appropriate training.

This job description includes the following tasks:

- Perform management tasks in the implementation of data-driven projects
- Perform management tasks in the operation of data-driven products
- Manage employees in the context of specialist teams
- Design the strategic use of data analysis
- Hire specialists in the field of data science
- Form the interface to other areas of the company
- Carry out cost estimates for project resources
- Evaluate the compliance of products/projects, including with regard to data protection

1.2 Qualification profile

The qualification objectives of the Master's degree program in Data Science & Intelligent Analytics meet both academic and professional requirements, as well as the requirements of the International Standard Classification of Education (ISCED) 0688.[1] The content taught qualifies graduates for the occupational fields mentioned in the previous section.

The intended learning outcomes are the ability to develop and implement data-driven products and solutions. This is achieved through practical training with a focus on the areas of data collection and storage, data analysis, data use, as well as business fundamentals.

As part of their studies, students acquire skills along the entire data life cycle, from data collection to data use. Phases A to E of the life cycle represent the actual processing phases in the typical sequence and are supported by the cross-sectional functions F and G.

The modules of the master's degree program in Data Science & Intelligent Analytics focus on the development of skills along the entire data life cycle. The following table shows the relationship between the occupational profiles, the key skills required for them, and the modules of the degree program. Different modules develop the necessary skills along the data lifecycle, sometimes overlapping with each other.

[1] The ISCED classification 0688 ("Inter-disciplinary programs and qualifications involving Information and Communication Technologies") is warranted because the modules of the master's degree program Data Science & Intelligent Analytics have their focus in ISCED area 06 ("Information and Communication Technologies"), while courses related to ISCED areas 054 ("Mathematics and Statistics") and 0413 ("Management and Administration") play a secondary role terms of their prominence in the curriculum.

Competencies in relation to the occupational fields

Occupational field	Task	Description of competency	Type of competency	Curriculum module(s)
Big Data & BI Consultant	Advise clients in the field of data science	The students have gained initial application experience with the platforms presented.	Professional/scientific competency	WPF - Compulsory elective subject
		Students are familiar with basic concepts and methods from the fields of Systematic Innovative Thinking, Systemic Management, and Innovation Management.	Professional/scientific competency	MDS - Management for Data Science
		Students are familiar with how basic algorithms in the field of data science work.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students are familiar with how advanced algorithms in the field of data science work.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students are familiar with the common tools used in the field of software development in data science.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students are familiar with the basic concepts of software development (e.g., object orientation, functional programming, etc.) that are frequently used in the field of data science.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students are familiar with the data structures, runtime specifics, and complexity classes required by the algorithms covered.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students have basic knowledge of data visualization and visual communication.	Professional/scientific competency	WPF - Compulsory elective subject
		Students are familiar with different strategies for implementing artificially intelligent systems.	Professional/scientific competency	DPR - Data Processing
		Students are familiar with various application-oriented analysis platforms.	Professional/scientific competency	WPF - Compulsory elective subject
		Students are familiar with the wider ethical and legal implications of the processing of data.	Personal/social competency	ETHR - Ethics & Law
		Students are familiar with advanced concepts of software development (e.g., pipelines, testing, etc.) that are frequently used in the field of data science.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students are familiar with advanced methods and tools for project management and the management of data-driven products.	Personal/social competency	MDS - Management for Data Science
		Students are familiar with tools (e.g., libraries, cloud platforms or software tools) that can be used to support machine learning.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students can work with various presentation tools and presentation libraries to present data and analysis results in a meaningful way.	Professional/scientific competency	WPF - Compulsory elective subject
		Students are able to apply the algorithms covered to isolated problems.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students are able to compare and evaluate the project management methods and tools covered with regard to their suitability for specific projects.	Personal/social competency	MDS - Management for Data Science
		Students can compare and evaluate the tools they have developed with regard to their suitability for specific problems.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students can independently apply the tools they have been familiarized with within the context of a specific project.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students can compare the analytical frameworks they have learned about with regard to their suitability for a specific application.	Professional/scientific competency	WPF - Compulsory elective subject
		Students can apply the methods and tools of project management in projects.	Personal/social competency	MDS - Management for Data Science
		Students can apply these advanced requirements with regard to data-driven projects.	Professional/scientific competency	ETHR - Ethics & Law
		Students can structure and manage a data-centered project.	Professional/scientific competency	MDS - Management for Data Science
		Students can design end-to-end machine learning projects.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students can independently carry out end-to-end machine learning projects.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics

Occupational field	Task	Description of competency	Type of competency	Curriculum module(s)
		Students are able to independently develop and apply appropriate solutions with regard to a specific problem.	Personal/social competency	DPR - Data Processing
		Students can configure basic data science algorithms for specific applications.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students are able to understand basic data science algorithms in practice.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students can develop basic application concepts and put them into an implementable form.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students can independently implement basic application concepts.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students can design basic applications to automate basic functionalities.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students can independently develop visualizations and use them for communication purposes.	Professional/scientific competency	WPF - Compulsory elective subject
		Students can develop strategies to design artificially intelligent systems for practical use.	Professional/scientific competency	DPR - Data Processing
		Students can configure advanced data science algorithms for specific applications.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students are able to understand advanced data science algorithms in practice.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students can develop advanced application concepts and put them into an implementable form.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students are able to independently implement advanced application concepts.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students can design advanced applications to automate basic functionalities.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students are able to apply specific creative techniques to generate innovations.	Professional/scientific competency	MDS - Management for Data Science
		Students are able to analyze the use of large amounts of data and exploitation strategies on the basis of these ethical and legal framework conditions and to develop procedures based on this analysis.	Professional/scientific competency	ETHR - Ethics & Law
		Students are able to select suitable algorithms for given problems.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students are familiar with the application of the concepts developed in frequently used software development environments in the field of data analysis (e.g., in Python, Mathlab, or R).	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students understand the statistical concepts and working methods behind the algorithms covered.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students understand the advantages and disadvantages of the strategies developed and are aware of the challenges they present.	Professional/scientific competency	DPR - Data Processing
Big Data Application Developer	Develop data-driven systems	Students have gained initial application experience with the platforms presented.	Professional/scientific competency	WPF - Compulsory elective subject
		Students are familiar with the particular challenges that arise when storing and processing large amounts of data (V model: Volume, Variety, Velocity, Veracity).	Professional/scientific competency	DPR - Data Processing
		Students are familiar with how basic algorithms in the field of data science work.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students are familiar with the common tools used in the field of software development in data science.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students are familiar with the basic concepts of software development (e.g., object orientation, functional programming, etc.) that are frequently used in the field of data science.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students are familiar with the data structures, runtime specifics and complexity classes required by the algorithms covered.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students are familiar with the data structures, runtime specifics and complexity classes required by the algorithms covered.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics

Occupational field	Task	Description of competency	Type of competency	Curriculum module(s)
		Students have basic knowledge of data visualization and visual communication.	Professional/scientific competency	WPF - Compulsory elective subject
		Students are familiar with ways of meeting these challenges. (Systems from the respective areas of the V-model are discussed as examples.)	Professional/scientific competency	DPR - Data Processing
		Students are familiar with different strategies for implementing artificially intelligent systems.	Professional/scientific competency	DPR - Data Processing
		Students are familiar with various application-oriented analysis platforms.	Professional/scientific competency	WPF - Compulsory elective subject
		Students are familiar with various advanced data storage concepts (e.g., NoSQL databases, distributed databases, etc.).	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students are familiar with advanced ethical and legal requirements for the processing of data.	Personal/social competency	ETHR - Ethics & Law
		Students are familiar with advanced concepts of software development (e.g., pipelines, testing, etc.) that are frequently used in the field of data science.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students are familiar with tools (e.g., libraries, cloud platforms or software tools) that can be used to support machine learning.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students can work with various presentation tools and presentation libraries to present data and analysis results in a meaningful way.	Professional/scientific competency	WPF - Compulsory elective subject
		Students can compare and select data storage concepts with regard to their suitability for projects.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students are able to apply the algorithms covered to isolated problems.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students can compare the tools they have developed with regard to their suitability for specific problems.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students can compare the analysis platforms they have learned about with regard to their suitability for a specific application.	Professional/scientific competency	WPF - Compulsory elective subject
		Students can apply these advanced requirements with regard to data-driven projects.	Professional/scientific competency	ETHR - Ethics & Law
		Students can carry out end-to-end machine learning projects.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students can design end-to-end machine learning projects.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students can carry out end-to-end machine learning projects independently	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students can configure basic data science algorithms for specific applications.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students will be able to understand basic data science algorithms in practice.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students can design basic applications to automate basic functionalities.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students can independently implement storage concepts in the context of a specific problem.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students can independently develop visualizations and use them for communication purposes.	Professional/scientific competency	WPF - Compulsory elective subject
		Students can configure advanced data science algorithms for specific applications.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students are able to understand advanced data science algorithms in practice.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students can design advanced applications to automate basic functionalities.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students are able to analyze the use of large amounts of data and exploitation strategies on the basis of these ethical and legal framework conditions and to develop procedures based on this.	Professional/scientific competency	ETHR - Ethics & Law

Occupational field	Task	Description of competency	Type of competency	Curriculum module(s)
		Students are able to select suitable algorithms for given problems.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students are able to select suitable algorithms for given problems.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students are familiar with the application of the concepts developed in frequently used software development environments in the field of data analysis (e.g., in Python, Mathlab, or R).	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students are also able to design the implementation of these systems with a view to scalability and operational requirements.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students understand the special requirements for data storage that arise from the use of very large amounts of data (big data).	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students understand the statistical concepts and working methods behind the algorithms covered.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
Data Engineer	Develop data models and integration strategies	Students are familiar with the particular challenges that arise when storing and processing large amounts of data (V model: Volume, Variety, Velocity, Veracity).	Professional/scientific competency	DPR - Data Processing
		Students are familiar with ways of meeting these challenges (Systems from the respective areas of the V-model are discussed as examples).	Professional/scientific competency	DPR - Data Processing
		Students are familiar with various advanced data storage concepts (e.g., NoSQL databases, distributed databases, etc.).	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students are familiar with advanced ethical and legal requirements for the processing of data.	Personal/social competency	ETHR - Ethics & Law
		Students can compare and select data storage concepts with regard to their suitability for projects.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students can independently implement storage concepts in the context of a specific problem.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students are able to analyze the use of large amounts of data and exploitation strategies on the basis of these ethical and legal framework conditions and to develop procedures based on this.	Professional/scientific competency	ETHR - Ethics & Law
		Students will also be able to design the implementation of these systems with a view to scalability and operational requirements.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students understand the special requirements for data storage that arise from the use of very large amounts of data (big data).	Professional/scientific competency	SDDE - Software Development & Data Engineering
Data Scientist	Deals with data-driven issues in the company	The students have gained initial application experience with the platforms presented.	Professional/scientific competency	WPF - Compulsory elective subject
		Students are familiar with the particular challenges that arise when storing and processing large amounts of data (V model: Volume, Variety, Velocity, Veracity).	Professional/scientific competency	DPR - Data Processing
		Students are familiar with how basic algorithms in the field of data science work.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students are familiar with how advanced algorithms in the field of data science work.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students are familiar with the common tools used in the field of software development in data science.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students are familiar with the basic concepts of software development (e.g., object orientation, functional programming, etc.) that are frequently used in the field of data science.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students are familiar with the data structures, runtime specifics, and complexity classes required by the algorithms covered.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students are familiar with the data structures, runtime specifics, and complexity classes required by the algorithms covered.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students have basic knowledge of data visualization and visual communication.	Professional/scientific competency	WPF - Compulsory elective subject
		Students are familiar with ways of meeting these challenges. (Systems from the respective areas of the V-model are discussed as examples.)	Professional/scientific competency	DPR - Data Processing
		Students are familiar with different strategies for implementing artificially intelligent systems.	Professional/scientific competency	DPR - Data Processing

Occupational field	Task	Description of competency	Type of competency	Curriculum module(s)
		Students are familiar with various application-oriented analysis platforms.	Professional/scientific competency	WPF - Compulsory elective subject
		Students are familiar with various advanced data storage concepts (e.g., NoSQL databases, distributed databases, etc.).	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students are familiar with further ethical and legal requirements for the processing of data.	Personal/social competency	ETHR - Ethics & Law
		Students are familiar with advanced concepts of software development (e.g., pipelines, testing, etc.) that are frequently used in the field of data science.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students are familiar with tools (e.g., libraries, cloud platforms, or software tools) that can be used to support machine learning.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students can work with various presentation tools and presentation libraries to present data and analysis results in a meaningful way.	Professional/scientific competency	WPF - Compulsory elective subject
		Students can compare and select data storage concepts with regard to their suitability for projects.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students will be able to apply the algorithms covered to isolated problems.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students will be able to apply the algorithms covered to isolated problems.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students can compare the tools they have developed with regard to their suitability for specific problems.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students can independently apply the tools they have learned in the context of a specific project.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students can compare the analysis platforms they have learned about with regard to their suitability for a specific application.	Professional/scientific competency	WPF - Compulsory elective subject
		Students can apply these advanced requirements with regard to data-driven projects.	Professional/scientific competency	ETHR - Ethics & Law
		Students can carry out end-to-end machine learning projects.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students can design end-to-end machine learning projects.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students can carry out end-to-end machine learning projects independently	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students are able to independently develop and apply appropriate solutions with regard to a specific problem.	Personal/social competency	DPR - Data Processing
		Students can configure basic data science algorithms for specific applications.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students are able to understand basic data science algorithms in practice.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students can develop basic application concepts and put them into an implementable form.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students can independently implement basic application concepts.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students can design basic applications to automate basic functionalities.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students are able to independently implement storage concepts in the context of a specific problem.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students can independently develop visualizations and use them for communication purposes.	Professional/scientific competency	WPF - Compulsory elective subject
		Students can develop strategies to design artificially intelligent systems for practical use.	Professional/scientific competency	DPR - Data Processing
		Students can configure advanced data science algorithms for specific applications.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics

Occupational field	Task	Description of competency	Type of competency	Curriculum module(s)
		Students are able to understand advanced data science algorithms in practice.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students can develop advanced application concepts and put them into an implementable form.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students are able to independently implement advanced application concepts.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students can design advanced applications to automate basic functionalities.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students are able to analyze the use of large amounts of data and exploitation strategies on the basis of these ethical and legal framework conditions and to develop procedures based on this.	Professional/scientific competency	ETHR - Ethics & Law
		Students are able to select suitable algorithms for given problems.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students are able to select suitable algorithms for given problems.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students are familiar with the application of the concepts developed in frequently used software development environments in the field of data analysis (e.g., in Python, Mathlab, or R).	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students are familiar with the application of the concepts developed in frequently used software development environments in the field of data analysis (e.g., in Python, Mathlab, or R).	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students are also able to design the implementation of these systems with a view to scalability and operational requirements.	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students understand the special requirements for data storage that arise from the use of very large amounts of data (big data).	Professional/scientific competency	SDDE - Software Development & Data Engineering
		Students understand the statistical concepts and working methods behind the algorithms covered.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students understand the statistical concepts and working methods behind the algorithms covered.	Professional/scientific competency	MLAL - Machine Learning & Algorithmics
		Students understand the advantages and disadvantages of the strategies developed and are aware of the challenges they face.	Professional/scientific competency	DPR - Data Processing
Manager for data science teams	Lead Data Scientists	Students are familiar with current practical issues in the field of data science.	Professional/scientific competency	WPF - Compulsory elective subject
		Students are familiar with current technological developments in the field of data science.	Professional/scientific competency	WPF - Compulsory elective subject
		Students are familiar with current thematic trends in the field of data science.	Professional/scientific competency	WPF - Compulsory elective subject
		Students are familiar with basic concepts and methods from the fields of Systematic Innovative Thinking, Systemic Management, and Innovation Management.	Professional/scientific competency	MDS - Management for Data Science
		Students are familiar with the relevant international discourse in the field.	Personal/social competency	MDS - Management for Data Science
		Students are familiar with the cultural factors influencing the discipline of data science from an international perspective.	Personal/social competency	MDS - Management for Data Science
		Students are familiar with the rules according to which scientific work functions.	Professional/scientific competency	MWA - Master thesis & scientific work
		Students are familiar with the basic areas of application of data collection, data storage, data analysis, and data use in the context of business applications.	Professional/scientific competency	MDS - Management for Data Science
		Students are familiar with the basic areas of application of data collection, data storage, data analysis, and data use in the context of scientific and technical applications.	Professional/scientific competency	MDS - Management for Data Science
		Students are familiar with advanced ethical and legal requirements for the processing of data.	Personal/social competency	ETHR - Ethics & Law
		Students are familiar with advanced methods and tools for project management and the management of data-driven products.	Personal/social competency	MDS - Management for Data Science
		Students are able to compare the project management methods and tools covered with regard to their suitability for specific projects.	Personal/social competency	MDS - Management for Data Science

Occupational field	Task	Description of competency	Type of competency	Curriculum module(s)
		Students can apply the methods and tools of project management in projects.	Personal/social competency	MDS - Management for Data Science
		Students can apply these rules to a specific project.	Professional/scientific competency	MWA - Master thesis & scientific work
		Students can structure and manage a data-centered project.	Professional/scientific competency	MDS - Management for Data Science
		Students can write a research proposal that successfully links the problem, research question, and methodological approach.	Professional/scientific competency	MWA - Master thesis & scientific work
		Students can apply their knowledge from the first two semesters in a data-centered project.	Professional/scientific competency	MDS - Management for Data Science
		Students can independently set up and carry out a scientific project.	Professional/scientific competency	MWA - Master thesis & scientific work
		Students can independently write a master's thesis in the field of data science.	Professional/scientific competency	MWA - Master thesis & scientific work
		Students can critically scrutinize scientific findings.	Professional/scientific competency	MWA - Master thesis & scientific work
		Students are able to apply specific creative techniques to generate innovations.	Professional/scientific competency	MDS - Management for Data Science
		Students are able to analyze the use of large amounts of data and exploitation strategies on the basis of these ethical and legal framework conditions and to develop procedures based on this analysis.	Professional/scientific competency	ETHR - Ethics & Law
		Students are able to independently design and implement data-based applications in this area, taking into account domain-specific requirements.	Professional/scientific competency	MDS - Management for Data Science
		Students understand the particular challenges of this area of application and are familiar with established best practice methods in this field.	Professional/scientific competency	MDS - Management for Data Science
		Students understand how influencing factors and discourse affect the discipline of data science from an international perspective.	Personal/social competency	MDS - Management for Data Science
		Students are familiar with how to present results to the scientific community.	Personal/social competency	MWA - Master thesis & scientific work
		Students are familiar with how scientific reviews are conducted.	Professional/scientific competency	MWA - Master thesis & scientific work
		Students can independently write a Master thesis in the field of Data Science.	Professional-academic competences	MWA - Master Thesis & Academic Methods
		Students can critically question scientific findings.	Professional-academic competences	MWA - Master Thesis & Academic Methods
		Students are able to apply specific creative techniques to generate innovations.	Professional-academic competences	MDS - Management for Data Science
		Students are able to analyze the use of large quantities of data and exploitation strategies based on these ethical and legal frameworks and to develop procedures based on them.	Professional-academic competences	ETHR - Ethics & Law
		This enables students to design and implement data-based applications in this area themselves, taking into account domain-specific requirements.	Professional-academic competences	MDS - Management for Data Science
		Students understand the special challenges of this field of application and are familiar with established best practice methods in this area.	Professional-academic competences	MDS - Management for Data Science
		Students understand how influential factors and discourse influence the discipline of data science in the foreign country concerned.	Personal/social skills	MDS - Management for Data Science
		Students are also aware of how to present results to a scientific community.	Personal/social skills	MWA - Master Thesis & Academic Methods
		Students are aware of how scientific reviews are conducted.	Professional-academic competences	MWA - Master Thesis & Academic Methods

2 CURRICULUM

2.1 Curriculum Data

	Full-Time	Program for working professionals, a.k.a. part-time program	Any comments
Year of first implementation (YYYY/YY$_{+1}$)	2025/2026	2021/2022	
Standard duration of program (Number of semesters)	4	4	
SWS (Semester Hours) (Total of all semesters)	47	47	
ECTS Points (Total of all semesters)	120	120	
Start of Winter Term (CW = Calendar Week)	CW 40	CW 40	
End of Winter Term (CW = Calendar Week)	CW 5	CW 5	
Start of Summer Term (CW = Calendar Week)	CW 11	CW 11	
End of Summer Term (CW = Calendar Week)	CW 28	CW 28	
Number of weeks in Winter Term	15	15	
Number of weeks in Summer Term	15	15	
Compulsory semester abroad	No	No	
Language of instruction	English	German	The proportion of courses taught in English is 100% in the Full-Time Program and 29% in the part-time program for working professionals (measured in relation to the total number of SWS).
Internship	No	No	
If the curriculum is the result of a merger of programs or separation from another program: Degree program codes [StgKz] of relevant programs			

2.2 Curriculummatrix

The curriculum matrix shows the courses of the degree program in relation to the semesters of the program. The matrix also lists the scope of the course (SWS, ASWS, ALVS, and ECTS), as well as a categorization in terms of language (English) and technicality. The complete presentation of the curriculum matrix can be found in Section 8 of the appendix to this application.

These figures do not include the work involved in supervising master's theses. However, for each supervised thesis at the University of Applied Sciences Kufstein Tirol, a supervision effort of 0.6 ASWS is

taken into account. With 25 students in the full-time organizational form and 33 students in the part-time organizational form for working professionals, an additional 34.8 ASWS of supervision work is therefore required. This means that a total of 64.5 ASWS is required for all four semesters of full-time study.

1. Semester

Course no.	Course title	LV-Typ	T	E	WSH	No. of groups	ASWS	ALVS	MODUL	ECTS
MDS.1	Leadership, Team & Project Management	ILV		X	1	1	1	15	MDS	2
MDS.2	Systemic Innovation	ILV		X	1	1	1	15	MDS	2
MLAL.1	Statistical Learning 1	ILV	X	X	3	1	3	45	MLAL	6
MLAL.2	Statistical Learning Lab 1	UE	X	X	1	2	2	30	MLAL	2.5
SDDE.1	Data Engineering	ILV	X	X	2	1	2	30	SDDE	4
SDDE.2	Software Development 1	ILV	X	X	3	1	3	45	SDDE	6
SDDE.3	Data Engineering Lab	UE	X	X	2	1	2	30	SDDE	5
SDDE.4	Software Development Lab 1	UE	X	X	1	2	2	30	SDDE	2.5
Total line:					14		16	240		30.0
Course hours = Total WSH x course weeks					210					

2. Semester

Course no.	Course title	LV-Typ	T	E	WSH	No. of groups	ASWS	ALVS	MODUL	ECTS
MDS.3	Study Trip	ILV		X	2	1	2	30	MDS	3
MLAL.3	Machine Learning & Deep Learning	ILV	X	X	4	1	4	60	MLAL	10
MLAL.5	Statistical Learning 2	ILV	X	X	3	1	3	45	MLAL	6
MLAL.6	Statistical Learning Lab 2	UE	X	X	1	2	2	30	MLAL	2.5
SDDE.5	Software Development 2	ILV	X	X	3	1	3	45	SDDE	6
SDDE.6	Software Development Lab 2	UE	X	X	1	2	2	30	SDDE	2.5
Total line:					14		16	240		30.0
Course hours = Total WSH x course weeks					210					

3. Semester

Course no.	Course title	LV-Typ	T	E	WSH	No. of groups	ASWS	ALVS	MODUL	ECTS
DPR.1	Big Data Processing	ILV	X	X	2	1	2	30	DPR	4
DPR.2	No-Code & Low-Code Analysis Platforms	ILV	X	X	2	1	2	30	DPR	4
DPR.3	Data Visualization & Visual Analytics	ILV		X	2	1	2	30	DPR	4
DPR.4	Artificial Intelligence	ILV	X	X	2	1	2	30	DPR	4
MDS.4	Integrated Application Project	PT	X	X	2	3	6	90	MDS	4
MDS.5	Data Science for Business & Commerce	ILV		X	1.75	1	1.75	26.25	MDS	4
MDS.6	Data Science for Engineering & Natural Sciences	ILV		X	1.75	1	1.75	26.25	MDS	4
MWA.1	Research Methods & Methodology	SE		X	1	1	1	15	MWA	2
Total line:					14.50		18.50	277.50		30
Course hours = Total WSH x course weeks					217.50					

4. Semester

Course no.	Course title	LV-Typ	T	E	WSH	No. of groups	ASWS	ALVS	MODUL	ECTS
DPR.5	Trends in Data Science	ILV		X	2	1	2	30	DPR	3
MDS.4	Ethics, Compliance & Legal Regulations	ILV		X	1.5	1	1.5	22.5	MDS	3
MWA.2	Master Thesis Colloquium	SE		X	1	1	1	15	MWA	2
MWA.2	Master Thesis	SE	X	X	0	1	0	0	MWA	22
Total line:					4.5		4.5	67.5		30
Course hours = Total WSH x course weeks					67.5					

Abbreviations	
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 curriculum data

Description	WSH	ASWS	ALVS	ECTS
Total number of courses over all semesters	47	55	825	120
Total number of courses in 1st year of study	28	32	480	60
Total number of courses in 2nd year of study	19	23	345	60
Total number of courses in 3rd year of study				
Total number of technical events over all semesters	32			91
Percentage of technical courses over all semesters based on WSH / ECTS	68.09 %			75.83 %
Total number of courses in English over all semesters	47			120
Proportion of courses in English over all semesters based on WSH / ECTS	100 %			100 %

2.3 Module descriptions

Module number:	**Software Development & Data Engineering**	**Scope:**	
SDDE		**26.0**	**ECTS**
Degree program	University of Applied Sciences Master's Program Data Science & Intelligent Analytics full-time		
Position in the curriculum	1. Semester		
	2. Semester		
Level	1. Semester: 1st semester: Master's course / 2nd semester: Master's course / 1. Semester: Master's course / 2. Semester: Master's course / 2. Semester: Master's course		
Previous knowledge	1. Semester: 1st semester: Students will have previous knowledge in the field of information technologies to the extent of 6 ECTS and therefore know the concept of the relational database and can read simple SQL queries. / 1st semester: Stu-dents will have previous knowledge in the field of information technologies to the extent of 6 ECTS and therefore know simple programming concepts (e.g. variables, branches, loops) as well as typical programming approaches (e.g. functional programming). / 2nd semester: SDDE.A1 module examination (Software Development 1 / 1. Semester: 1st semester: Students will have previous knowledge in the field of information technologies to the extent of 6 ECTS and therefore know the concept of the relational database and can read simple SQL queries. / 1st semester: Students will have previous knowledge in the field of information technologies to the extent of 6 ECTS and therefore know simple programming concepts (e.g. variables, branches, loops) as well as typical programming approaches (e.g. functional programming). / 2nd semester: SDDE.A1 module examination (Software Development 1) / 2. Semester: 1st semester: Students will have previous knowledge in the field of information technologies to the extent of 6 ECTS and therefore know the concept of the relational database and can read simple SQL queries. / 1st semester: Stu-dents will have previous knowledge in the field of information technologies to the extent of 6 ECTS and therefore know simple programming concepts (e.g. variables, branches, loops) as well as typical programming approaches (e.g. functional programming). / 2nd semester: SDDE.A1 module examination (Software Development 1) / 2. Semester: 1st semester: Students will have previous knowledge in the field of information technologies to the extent of 6 ECTS and therefore know the concept of the relational database and can read simple SQL queries. / 1st semester: Students will have previous knowledge in the field of information technologies to the extent of 6 ECTS and therefore know simple programming concepts (e.g. variables, branches, loops) as well as typical programming approaches (e.g. functional programming). / 2nd semester: SDDE.A1 module examination (Software Development 1)		
Blocked	no		
Participant group	Bachelor graduates, beginners		
Literature recommendation	Data Engineering /ILV / LV-Nr: SDDE.1 / 1.Semester / ECTS: 4 PRIMARY LITERATURE: - Kleppmann, M. (2017): Designing Data-Intensive Applications: The Big Ideas Behind Reliable, Scalable, and Maintain-able Systems (Ed. 1), O'Reilly Media, Farnham (ISBN: 978-1449373320) SECONDARY LITERATURE: - Celko, J. (2013): Joe Celko's Complete Guide to NoSQL: What Every SQL Professional Needs to Know about Non-Relational Databases (Ed. 1), Morgan Kaufmann, Waltham (ISBN: 978-0124071926		
	Software Development 1 /ILV / LV-Nr: SDDE.2 / 1.Semester / ECTS: 6 PRIMARY LITERATURE: - Lutz, M (2013): Learning Python (Ed. 1), O'Reilly Media, Farnham (ISBN: 978-1449355739) SECONDARY LITERATURE: - Sommerville, I. (2015): Software Engineering, Global Edition (Ed. 10), Pearson Education, London (ISBN: 978-1292096131) - Williams, L.; Zimmermann, T. (2016): Perspectives on Data Science for Software Engineering (Ed. 1), Morgan Kauf-mann, Burlington (ISBN: 978-0128042069) - Crawley, M. J. (2012): The R Book (Ed. 2), John Wiley and Sons Ltd, Chichester (ISBN: 978-0-470-51024-7)		
	Data Engineering Lab /UE / LV-Nr: SDDE.3 / 1.Semester / ECTS: 5 PRIMARY LITERATURE: - Kleppmann, M. (2017): Designing Data-Intensive Applications: The Big Ideas Behind Reliable, Scalable, and Maintain-able Systems (Ed. 1), O'Reilly Media, Farnham (ISBN: 978-1449373320) SECONDARY LITERATURE: - Celko, J. (2013): Joe Celko's Complete Guide to NoSQL: What Every SQL Professional Needs to Know about Non-Relational Databases (Ed. 1), Morgan Kaufmann, Waltham (ISBN: 978-0124071926)		
	Software Development Lab 1 /UE / LV-Nr: SDDE.4 / 1.Semester / ECTS: 2.5		

	PRIMARY LITERATURE: - Lutz, M (2013): Learning Python (Ed. 1), O'Reilly Media, Farnham (ISBN: 978-1449355739) SECONDARY LITERATURE: - Sommerville, I. (2015): Software Engineering, Global Edition (Ed. 10), Pearson Education, London (ISBN: 978-1292096131) - Williams, L.; Zimmermann, T. (2016): Perspectives on Data Science for Software Engineering (Ed. 1), Morgan Kauf-mann, Burlington (ISBN: 978-0128042069) - Crawley, M. J. (2012): The R Book (Ed. 2), John Wiley and Sons Ltd, Chichester (ISBN: 978-0-470-51024-7)
	Software Development 2 /ILV / LV-Nr: SDDE.5 / 2.Semester / ECTS: 6 PRIMARY LITERATURE: - Lutz, M (2013): Learning Python (Ed. 1), O'Reilly Media, Farnham (ISBN: 978-1449355739) SECONDARY LITERATURE:
Literature recommendation	- Sommerville, I. (2015): Software Engineering, Global Edition (Ed. 10), Pearson Education, London (ISBN: 978-1292096131) - Williams, L.; Zimmermann, T. (2016): Perspectives on Data Science for Software Engineering (Ed. 1), Morgan Kauf-mann, Burlington (ISBN: 978-0128042069) - Crawley, M. J. (2007): The R Book (Ed. 1), John Wiley and Sons Ltd, Chichester (ISBN: 978-0-470-51024-7
	Software Development Lab 2 /UE / LV-Nr: SDDE.6 / 2.Semester / ECTS: 2.5 PRIMARY LITERATURE: - Lutz, M (2013): Learning Python (Ed. 1), O'Reilly Media, Farnham (ISBN: 978-1449355739) SECONDARY LITERATURE: - Sommerville, I. (2015): Software Engineering, Global Edition (Ed. 10), Pearson Education, London (ISBN: 978-1292096131) - Williams, L.; Zimmermann, T. (2016): Perspectives on Data Science for Software Engineering (Ed. 1), Morgan Kauf-mann, Burlington (ISBN: 978-0128042069) - Crawley, M. J. (2007): The R Book (Ed. 1), John Wiley and Sons Ltd, Chichester (ISBN: 978-0-470-51024-7)
Acquisition of skills	Data Engineering /ILV / LV-Nr: SDDE.1 / 1.Semester / ECTS: 4 The following skills are developed in the course: - Students are familiar with various advanced data storage concepts (e.g. NoSQL databases, distributed databases, etc.). - Students can compare and select data storage concepts with regard to their suitability for projects. - Students understand the special requirements for data storage resulting from the use of very quantities amounts of data (Big Data).
	Software Development 1 /ILV / LV-Nr: SDDE.2 / 1.Semester / ECTS: 6 The following skills are developed in the course: - Students are familiar with the basic concepts of software development (e.g. object orientation, functional program-ming etc.) which are frequently applied in the field of data science. - Students are familiar with the application of the concepts developed in frequently-used software development environments in the field of data analysis (e.g. in Python, MATLAB or R). - Students are familiar with the common tools used in the field of software development in Data Science. - Students can design basic applications to automate basic functionalities. - Students can implement designed applications independently.
	Data Engineering Lab /UE / LV-Nr: SDDE.3 / 1.Semester / ECTS: 5 The following skills are developed in the course: - Students can implement storage concepts themselves in the context of a specific problem. - Students are also able to design the implementation of these systems with regard to scalability and operational requirements.
	Software Development Lab 1 /UE / LV-Nr: SDDE.4 / 1.Semester / ECTS: 2.5 The following skills are developed in the course: - Students can implement basic application concepts independently. - Students can develop basic application concepts and put them into an implementable form.
	Software Development 2 /ILV / LV-Nr: SDDE.5 / 2.Semester / ECTS: 6

	The following skills are developed in the course: - Students are familiar with advanced concepts of software development (e.g. pipelines, testing, etc.) which are frequently applied in the field of data science. - Students are familiar with the application of the concepts developed in frequently-used software development environments in the field of data analysis (e.g. in Python, MATLAB or R). - Students can design advanced applications to automate basic functionalities. - Students can implement designed applications independently.
	Software Development Lab 2 /UE / LV-Nr: SDDE.6 / 2.Semester / ECTS: 2.5 The following skills are developed in the course: - Students can implement advanced application concepts independently. - Students can develop advanced application concepts and bring them into an implementable form.
Course contents	Data Engineering /ILV / LV-Nr: SDDE.1 / 1.Semester / ECTS: 4 The following content is discussed in the course: - Properties of high-performance data systems (scalability, maintainability, reliability) - Established concepts of data storage (Relational Model) - Historical concepts of data storage (Hierarchical Model, Network Model) - Modern concepts of data storage (Wide-Column Model, Graph Model, Key-Value Model, Document Model, Column-Oriented Model) - Database systems, matching the models discussed - Scaling of data systems (replication and partitioning)

Course contents	- Writing and reading in data systems (index structures, write strategies)
	Software Development 1 /ILV / LV-Nr: SDDE.2 / 1.Semester / ECTS: 6 The following content is discussed in the course: - The process of software engineering and project management for data-intensive applications - Programming paradigms for use in data science - Effective and efficient data structures for data-intensive applications - Tools and software ecosystems for the development and testing of data-intensive software systems
	Data Engineering Lab /UE / LV-Nr: SDDE.3 / 1.Semester / ECTS: 5 The following content is discussed in the course: - Design and implementation of problem-centred NoSQL databases (e.g. key-value stores, document stores, column-oriented data stores, etc.) - Design and implementation of storage solutions for large quantities of data (big data)
	Software Development Lab 1 /UE / LV-Nr: SDDE.4 / 1.Semester / ECTS: 2.5 In the lab, the contents of the ILV "Software Development 1" are advanced with the aid of practical exercises. The knowledge gained will be discussed in the group and thus allow a deep insight into the material and consolidation of the knowledge, which was theoretically dealt with in the ILV
	Software Development 2 /ILV / LV-Nr: SDDE.5 / 2.Semester / ECTS: 6 The following content is discussed in the course: - Architecture models for data-driven software development and systems - Integration models and paradigms for implementing complex, process-oriented software ecosystems for analytical and data-driven systems - Application of proven design patterns for data-driven applications - Design and implementation of efficient and scalable software systems for data-driven applications - Testing of software applications (e.g. unit tests, integration tests, etc.)
	Software Development Lab 2 /UE / LV-Nr: SDDE.6 / 2.Semester / ECTS: 2.5 In the lab, the contents of the ILV "Software Development 2" are advanced with the aid of practical exercises. The knowledge gained will be discussed in the group and thus allow a deep insight into the material and consolidation of the knowledge, which was theoretically dealt with in the ILV
Teaching and learning methods	Data Engineering /ILV / LV-Nr: SDDE.1 / 1.Semester / ECTS: 4 The following methods are used: - Lecture with discussion - Processing of exercises - Interactive workshop
	Software Development 1 /ILV / LV-Nr: SDDE.2 / 1.Semester / ECTS: 6 The following methods are used: - Lecture with discussion - Processing of exercises - Interactive workshop
	Data Engineering Lab /UE / LV-Nr: SDDE.3 / 1.Semester / ECTS: 5 The following methods are used: - Processing of exercises - Lecture with discussion
	Software Development Lab 1 /UE / LV-Nr: SDDE.4 / 1.Semester / ECTS: 2.5 The following methods are used: - Lecture with discussion - Processing of exercises
	Software Development 2 /ILV / LV-Nr: SDDE.5 / 2.Semester / ECTS: 6 The following methods are used: - Lecture with discussion - Processing of exercises - Interactive workshop
	Software Development Lab 2 /UE / LV-Nr: SDDE.6 / 2.Semester / ECTS: 2.5

	The following methods are used: - Processing of exercises - Interactive workshop Data Engineering /ILV / Course no.: SDDE.1 / 1st semester / ECTS: 4
Evaluation Methods Criteria	Data Engineering /ILV / LV-Nr: SDDE.1 / 1.Semester / ECTS: 4 Written exam
	Software Development 1 /ILV / LV-Nr: SDDE.2 / 1.Semester / ECTS: 6 Written exam
	Data Engineering Lab /UE / LV-Nr: SDDE.3 / 1.Semester / ECTS: 5 The following examination methods are used in the course: - Project work - term paper
	Software Development Lab 1 /UE / LV-Nr: SDDE.4 / 1.Semester / ECTS: 2.5 The following examination methods are used in the course: - Project work - term paper
	Software Development 2 /ILV / LV-Nr: SDDE.5 / 2.Semester / ECTS: 6 Written exam
	Software Development Lab 2 /UE / LV-Nr: SDDE.6 / 2.Semester / ECTS: 2.5 The following examination methods are used in the course: - Project work - term paper

Module number:	**Machine Learning & Algorithmics**	**Scope:**	
MLAL		**27.0**	**ECTS**
Degree program	University of Applied Sciences Master's Program Data Science & Intelligent Analytics full-time		
Position in the curriculum	1. Semester		
	2. Semester		
Level	1. Semester: Master's course / 1. Semester: Master's course / 2. Semester: Master's course / 2. Semester: Master's course		
Previous knowledge	1. Semester: 1st semester: Students have previous knowledge of mathematics/statistics up to 8 ECTS and therefore know simple statistical measures as well as basic statistical test procedures (e.g. t-test). / 2nd semester: No prerequisites / 2nd semester: Module examination MLAL.A1 (Algorithmic 1) / 2. Semester: 1st semester: Students have previous knowledge of mathematics/statistics up to 8 ECTS and therefore know simple statistical measures as well as basic statistical test procedures (e.g. t-test). / 2nd semester: No prerequisites / 2nd semester: Module examination MLAL.A1 (Algorithmic 1) / 2. Semester: Module examina-		
Blocked	no		
Participant group	Bachelor graduates, beginners		
Literature recommendation	Statistical Learning 1 /ILV / LV-Nr: MLAL.1 / 1.Semester / ECTS: 6 PRIMARY LITERATURE: - Murphy, K. P. (2012): Machine Learning: A Probabilistic Perspective (Ed. 1), MIT Press, Cambridge (ISBN: 978-0-262-01802-9) - Bishop, C. (2006): Pattern Recognition and Machine Learning (Ed. 1), Springer-Verlag, New York (ISBN: 978-0-387-31073-2) SECONDARY LITERATURE: - James, G.; Witten, D; Hastie, T.; Tibshirani, R. (2013): An Introduction to Statistical Learning: with Applications in R (Ed. 1), Springer Science and Business Media, New York (ISBN: 978-1-461-471387) - Steele, B.; Chandler, J.; Reddy, S. (2016): Algorithms for Data Science (Ed. 1), Springer, Berlin (ISBN: 978-3319457956)		
	Statistical Learning Lab 1 /UE / LV-Nr: MLAL.2 / 1.Semester / ECTS: 2.5		

	PRIMARY LITERATURE: - Murphy, K. P. (2012): Machine Learning: A Probabilistic Perspective (Ed. 1), MIT Press, Cambridge (ISBN: 978-0-262-01802-9) - Bishop, C. (2006): Pattern Recognition and Machine Learning (Ed. 1), Springer-Verlag, New York (ISBN: 978-0-387-31073-2) SECONDARY LITERATURE: - James, G.; Witten, D; Hastie, T.; Tibshirani, R. (2013): An Introduction to Statistical Learning: with Applications in R (Ed. 1), Springer Science and Business Media, New York (ISBN: 978-1-461-471387) - Steele, B.; Chandler, J.; Reddy, S. (2016): Algorithms for Data Science (Ed. 1), Springer, Berlin (ISBN: 978-3319457956)
	Machine Learning & Deep Learning /ILV / LV-Nr: MLAL.3 / 2.Semester / ECTS: 10 PRIMARY LITERATURE: - Géron, A. (2017): Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques for Building Intelligent Systems (Ed. 1), O´Reilly, Farnham (ISBN: 978-1491962299)
	Statistical Learning 2 /ILV / LV-Nr: MLAL.5 / 2.Semester / ECTS: 6 PRIMARY LITERATURE: - Murphy, K. P. (2012): Machine Learning: A Probabilistic Perspective (Ed. 1), MIT Press, Cambridge (ISBN: 978-0-262-01802-9) - Bishop, C. (2006): Pattern Recognition and Machine Learning (Ed. 1), Springer-Verlag, New York (ISBN: 978-0-387-31073-2) SECONDARY LITERATURE: - James, G.; Witten, D; Hastie, T.; Tibshirani, R. (2013): An Introduction to Statistical Learning: with Applications in R (Ed. 1), Springer Science and Business Media, New York (ISBN: 978-1-461-471387) - Steele, B.; Chandler, J.; Reddy, S. (2016): Algorithms for Data Science (Ed. 1), Springer, Berlin (ISBN: 978-3319457956)
	Statistical Learning Lab 2 /UE / LV-Nr: MLAL.6 / 2.Semester / ECTS: 2.5 PRIMARY LITERATURE: - Murphy, K. P. (2012): Machine Learning: A Probabilistic Perspective (Ed. 1), MIT Press, Cambridge (ISBN: 978-0-262-01802-9) - Bishop, C. (2006): Pattern Recognition and Machine Learning (Ed. 1), Springer-Verlag, New York (ISBN: 978-0-387-31073-2) SECONDARY LITERATURE: - James, G.; Witten, D; Hastie, T.; Tibshirani, R. (2013): An Introduction to Statistical Learning: with Applications in R (Ed. 1), Springer Science and Business Media, New York (ISBN: 978-1-461-471387) - Steele, B.; Chandler, J.; Reddy, S. (2016): Algorithms for Data Science (Ed. 1), Springer, Berlin (ISBN: 978-3319457956)
Acquisition of skills	Statistical Learning 1 /ILV / LV-Nr: MLAL.1 / 1.Semester / ECTS: 6 The following skills are developed in the course:

Acquisition of skills	- Students are familiar with the functionality of basic algorithms in the field of data science. - Students understand the statistical concepts and working methods behind the algorithms covered. - Students are able to select suitable algorithms for given problems. - Students are familiar with the data structures, runtime specifics and complexity classes required by the algorithms covered. - Students can apply the algorithms in isolated problems.
	Statistical Learning Lab 1 /UE / LV-Nr: MLAL.2 / 1.Semester / ECTS: 2.5 The following skills are developed in the course: - Students can practically understand basic algorithms of data science. - Students can configure basic algorithms of data science for specific purposes. - Students can apply the algorithms in isolated problems.
	Machine Learning & Deep Learning /ILV / LV-Nr: MLAL.3 / 2.Semester / ECTS: 10 The following skills are developed in the course: - Students are familiar with tools (e.g. libraries, cloud platforms or software tools), with which machine learning can be supported. - Students can compare the tools developed with regard to their suitability for specific problems. - Students can design end-to-end machine learning projects. - Students can carry out end-to-end machine learning projects independently.
	Statistical Learning 2 /ILV / LV-Nr: MLAL.5 / 2.Semester / ECTS: 6

	The following skills are developed in the course: - Students can practically understand advanced algorithms of data science. - Students can configure advanced algorithms of data science for specific purposes. - Students can apply the algorithms in isolated problems.
	Statistical Learning Lab 2 /UE / LV-Nr: MLAL.6 / 2.Semester / ECTS: 2.5 The following skills are developed in the course: - Students can practically understand advanced algorithms of data science. - Students can configure advanced algorithms of data science for specific purposes. - Students can apply the algorithms in isolated problems.
Course contents	Statistical Learning 1 /ILV / LV-Nr: MLAL.1 / 1.Semester / ECTS: 6 The following content is discussed in the course: - Statistical measures (point and interval estimators) - Statistical test procedures - Grouping algorithms (classification trees, agglomerative hierarchical clustering, etc.) - Regression algorithms (regression trees, random forests, etc.) - Associative algorithms - Procedures for preprocessing data (e.g. principal component analysis)
	Statistical Learning Lab 1 /UE / LV-Nr: MLAL.2 / 1.Semester / ECTS: 2.5 In the lab, the contents of the ILV "Statistical Learning 1" are advanced with the aid of practical exercises. The knowledge gained will be discussed in the group and thus allow a deep insight into the material and consolidation of the knowledge, which was theoretically dealt with in the ILV.
	Machine Learning & Deep Learning /ILV / LV-Nr: MLAL.3 / 2.Semester / ECTS: 10 The following content is discussed in the course: - Classical neural networks as a supplement to classical algorithms of data science (e.g. Random Forests, SCM, etc.) - Fallen, artificial neural networks (CNN) - Recursive, artificial neural networks (RNN, LSTM) - Continuing, artificial neural networks (GAN, FARM, BERT, CGAN, etc.) The network types discussed are subject to constant change. For this reason, only a few network types are mentioned here as examples. Current network types are also discussed and applied in the course.
	Statistical Learning 2 /ILV / LV-Nr: MLAL.5 / 2.Semester / ECTS: 6 The following content is discussed in the course: - Advanced modelling techniques - Ensemble methods - Optimization of models
	Statistical Learning Lab 2 /UE / LV-Nr: MLAL.6 / 2.Semester / ECTS: 2.5 In the lab, the contents of the ILV "Statistical Learning 2" are advanced with the aid of practical exercises. The knowledge gained will be discussed in the group and thus allow a deep insight into the material and consolidation of the knowledge, which was theoretically dealt with in the ILV.

Teaching and learning methods	Statistical Learning 1 /ILV / LV-Nr: MLAL.1 / 1.Semester / ECTS: 6 The following methods are used: - Lecture with discussion - Processing of exercises - Interactive workshop
	Statistical Learning Lab 1 /UE / LV-Nr: MLAL.2 / 1.Semester / ECTS: 2.5 The following methods are used: - Processing of exercises - Interactive workshop
	Machine Learning & Deep Learning /ILV / LV-Nr: MLAL.3 / 2.Semester / ECTS: 10 The following methods are used: - Processing of exercises - Interactive workshop
	Statistical Learning 2 /ILV / LV-Nr: MLAL.5 / 2.Semester / ECTS: 6 The following methods are used: - Lecture with discussion - Processing of exercises - Interactive workshop
	Statistical Learning Lab 2 /UE / LV-Nr: MLAL.6 / 2.Semester / ECTS: 2.5 The following methods are used: - Processing of exercises - Interactive workshop
Evaluation Methods Criteria	Statistical Learning 1 /ILV / LV-Nr: MLAL.1 / 1.Semester / ECTS: 6 Written exam
	Statistical Learning Lab 1 /UE / LV-Nr: MLAL.2 / 1.Semester / ECTS: 2.5 The following examination methods are used in the course: - Project work - term paper
	Machine Learning & Deep Learning /ILV / LV-Nr: MLAL.3 / 2.Semester / ECTS: 10 Project documentation and presentation
	Statistical Learning 2 /ILV / LV-Nr: MLAL.5 / 2.Semester / ECTS: 6 Written exam
	Statistical Learning Lab 2 /UE / LV-Nr: MLAL.6 / 2.Semester / ECTS: 2.5 The following examination methods are used in the course: - Project work - term paper

Module number:	**Management for Data Science**	**Scope:**	
MDS		**22**	**ECTS**
Degree program	University of Applied Sciences Master's Program Data Science & Intelligent Analytics full-time		
Position in the curriculum	1. Semester		
	2. Semester		
	3. Semester		
	4. Semester		
Level	1. Semester: Master's course / 2. Semester: Master's course / 3. Semester: English version available soon / 3. Semester: Master's course / 4. Semester: Master's course		
Previous knowledge	1. Semester: 1st semester: No prerequisites / 2. Semester: 2nd semester: No prerequisites / 3. Semester: 3rd semester: No prerequisites / 4. Semester: No prerequisites		
Blocked	no		
Participant group	Bachelor graduates, beginners		
Literature recommendation	Leadership, Team & Project Management /ILV / LV-Nr: MDS.1 / 1.Semester / ECTS: 2 PRIMARY LITERATURE: - Michels, B. (2017): Projektmanagement Handbuch (Ed. 3), CreateSpace Independent Publishing Platform, online (ISBN: 978-1545335482) SECONDARY LITERATURE: - Gellert, M.; Nowak, C. (2010): Teamarbeit, Teamentwicklung, Teamberatung: Ein Praxisbuch für die Arbeit in und mit Teams (Ed. 4), Limmer, C., Meezen (ISBN: 978-3928922135) - Kerzner, H. (2017): Project Management: A Systems Approach to Planning, Scheduling, and Controlling (Ed. 12), Wiley, Weinheim (ISBN: 978-1119165354) - Klose, B. (2008): Projektabwicklung: Arbeitshilfen, Fallbeispiele und Checklisten im Projektmanagement (Ed. 5), mi-Wirtschaftsbuch, München (ISBN: 978-3636031648) - Litke, H-D. (2007): Project management: Methoden, Techniken, Verhaltensweisen (Ed. 5), Carl Hanser Verlag, Munich (ISBN: 978-3446409972)		
	Systemic Innovation /ILV / LV-Nr: MDS.2 / 1.Semester / ECTS: 2 PRIMARY LITERATURE: - Brenner, W.; Uebernickel, F. (2016): Design Thinking for Innovation: Research and Practice (Ed. 1), Springer, Berlin (ISBN: 978-3319260983) - Brown, T. (2012): Change by Design: how design thinking transforms organizations and inspires innovation (Ed. 2), Harper Business, New York (ISBN: 978-3319260983) SECONDARY LITERATURE: - Achouri C. (2011): Wenn Sie wollen, nennen Sie es Führung: Systemisches Management im 21. Jahrhundert (Ed. 1), Gabal, Offenbach (ISBN: 978-3-86936-174-1) - Achouri C. (2015): Systemisches Management. In: Human Resources Management: Eine praxisbasierte Einführung (Ed. 2), Gabler, Wiesbaden (ISBN: 978-3834947390) - Bergmann, G.; Daub, J. (2008): Systemisches Innovations- und Kompetenzmanagement: Grundlagen - Prozesse - Perspektiven (Ed. 2), Gabler, Wiesbaden (ISBN: 978-3834910592) - Kearney, E. (2013): Diversity und Innovation, page 175 in Krause D. E. (publisher) Kreativität, Innovation, Entrepreneurship (ed. 1), Springer Gabler, Wiesbaden (ISBN: 978-3658025502) - Orloff, M. A. (2010): Inventive Thinking through TRIZ: A Practical Guide (Ed. 1), Springer, Berlin (ISBN: 978-3642069802) - Orloff, M. A. (2012): Modern TRIZ: A Practical Course with EASyTRIZ Technology (Ed. 1), Springer, Berlin (ISBN: 978-3642252174) - Tidd, J.; Bessant, J. (2013): Managing Innovation: Integrating Technological, Market and Organizational Change (Ed. 5), Wiley, Chichester (ISBN: 978-1118360637)		
	Study Trip /ILV / LV-Nr: MDS.3 / 2.Semester / ECTS: 3 PRIMARY LITERATURE: - Dumetz, J; Trompenaars, F.; Dumetz, J.; Saginova, O.; Covey, S.; Hampden-Turner, S.; Woolliams, P.; Schmitz, J.; Foster, D.; Belbin, M; Schein, E. (2012): Cross-cultural management textbook: Lessons from the world leading experts in cross-cultural management (Ed. 1), CreateSpace Independent Publishing Platform, Delaware (ISBN: 978-1479159680) SECONDARY LITERATURE: - Beise, M. (2013): Lead Markets. Country-Specific Success Factors of the Global Diffusion of Innovations (Ed.), Physica-Verlag, Heidelberg (ISBN: 978-3790814309) - Thomas, A.; Kinast, E.; Schroll-Machl, S. (2003): Handbuch Interkulturelle Kommunikation und Kooperation: Grundlagen und Praxistransfer (Band 1) (Ed. 2), Vandenhoeck and Ruprecht, Göttingen (ISBN: 978-3525461723) - Thomas, D. C. (2014): Cross-Cultural Management: Essential Concepts (Ed. 4), SAGE Publishing, Thousand Oaks (ISBN: 978-14112939560) - Jones, E. (2006): Cultures Merging: A Historical and Economic Critique of Culture (Ed. 1), Princeton University Press, New Jersey (ISBN: 978-0691171043)		
	Ethics, Compliance & Legal Regulations /ILV / LV-Nr: MDS.4 / 4.Semester / ECTS: 3		

	PRIMARY LITERATURE: - Gola, P.; Reif, Y. (2016): Praxisfälle Datenschutzrecht: Juristische Sachverhalte Schritt für Schritt prüfen, bewerten und lösen (Ed. 2), DATAKONTEXT, Frechen (ISBN: 978-3895777677) SECONDARY LITERATURE:

Literature recommendation	- Floridi, L. (2015): The Ethic of Information (Ed. 1), Oxford University Press, Oxford (ISBN: 978-0198748052) - Lynskey, O. (2016): The Foundations of EU Data Protection Law (Ed. 1), Oxford University Press, Oxford (ISBN: 978-0-19-871823-9) - Taeger, J. (2014): Datenschutzrecht: Einführung (Ed. 1), Deutscher Fachverlag, Frankfurt am Main (ISBN: 978-3800515370) - Worms, N. (2010): Informationsethik und Online-Netzwerke: Im Spannungsfeld zwischen strukturel-
	Integrated Application Project /PT / LV-Nr: MDS.4 / 3.Semester / ECTS: 4 PRIMARY LITERATURE: - Patzak, G.; Rattay, G. (2017): Project management: Projekte, Projektportfolios, Programme und projektorientierte Unternehmen (Ed. 7), Linde Verlag, Vienna (ISBN: 978-3714303216) SECONDARY LITERATURE: - Schöneck, N. M.; Voß, W. (2013): Das Forschungsprojekt: Planung, Durchführung und Auswertung einer quantitati-ven Studie (Ed. 2), Springer VS, Wiesbaden (ISBN: 978-3531195018)
	Data Science for Business & Commerce /ILV / LV-Nr: MDS.5 / 3.Semester / ECTS: 4 PRIMARY LITERATURE: - Cady, F. (2017): The Data Science Handbook (Ed. 2), Wiley, Hoboken (ISBN: 978-1119092940) SECONDARY LITERATURE: - Meier, A.; Stormer, H. (2012): eBusiness and eCommerce: Management der digitalen Wertschöp-fungskette (Ed. 3), Springer, Berlin (ISBN: 978-3-642-29801-1)
	Data Science for Engineering & Natural Sciences /ILV / LV-Nr: MDS.6 / 3.Semester / ECTS: 4 English version available soon
Acquisition of skills	Leadership, Team & Project Management /ILV / LV-Nr: MDS.1 / 1.Semester / ECTS: 2 The following skills are developed in the course: - Students are familiar with advanced methods and tools for project management and managing data-driven prod-ucts. - Students can compare the methods and tools of project management that were dealt with, with re-gard to their suitability in specific projects. - Students can apply the methods and tools of project management in projects.
	Systemic Innovation /ILV / LV-Nr: MDS.2 / 1.Semester / ECTS: 2 The following skills are developed in the course: - Students are familiar with basic concepts and methods from the subject areas of Systematic Innova-tive Thinking, Systemic Management and Innovation Management. - Students are able to apply specific creative techniques to generate innovations.
	Study Trip /ILV / LV-Nr: MDS.3 / 2.Semester / ECTS: 3 The following skills are developed in the course: - Students are familiar with the discourse relevant to their subject in the foreign country concerned. - Students are familiar the cultural factors influencing the discipline of Data Science in the foreign country concerned. - Students understand how influential factors and discourse influence the discipline of data science in the foreign country concerned.
	Ethics, Compliance & Legal Regulations /ILV / LV-Nr: MDS.4 / 4.Semester / ECTS: 3 The following skills are developed in the course: - Students are familiar with further ethical and legal requirements for data processing. - Students can apply these advanced requirements to data-driven projects. - Students are able to analyze the use of large quantities of data and exploitation strategies based on these ethical and legal frameworks and to develop procedures based on them.
	Integrated Application Project /PT / LV-Nr: MDS.4 / 3.Semester / ECTS: 4 The following skills are developed in the course: - Students can apply their knowledge from the first two semesters in a data-centric project. - Students can structure and manage a data-centric project.
	Data Science for Business & Commerce /ILV / LV-Nr: MDS.5 / 3.Semester / ECTS: 4

	The following skills are developed in the course: - Students know the basic application areas of data collection, data storage, data analysis and data use in the context of business-related applications. - Students understand the special challenges of this field of application and are familiar with established best practice methods in this area. - Students are also able to design and implement data-based applications in this area themselves, ta-

	account domain-specific requirements.
Acquisition of skills	Data Science for Engineering & Natural Sciences /ILV / LV-Nr: MDS.6 / 3.Semester / ECTS: 4 The following skills are developed in the course: - Students know the basic application areas of data collection, data storage, data analysis and data use in the context of scientific and technical applications. - Students understand the special challenges of this field of application and are familiar with established best practice methods in this area. - This enables students to design and implement data-based applications in this area themselves, taking into account domain-specific requirements.
Course contents	Leadership, Team & Project Management /ILV / LV-Nr: MDS.1 / 1.Semester / ECTS: 2 The following content is discussed in the course: - Project management techniques (e.g. SCRUM) - Project management tools in the field of data science (e.g. GitLab) - Techniques for documenting requirements (e.g. Sophist)
	Systemic Innovation /ILV / LV-Nr: MDS.2 / 1.Semester / ECTS: 2 The following content is discussed in the course: - Developing a holistic understanding of the subject areas (systemic management) -Methods for generating innovative ideas (e.g. Systematic Inventive Thinking, Design Thinking) - Project structures and management methods for the practical implementation of innovations (e.g. change manage-ment, conflict management) - IT-supported project documentation
	Study Trip /ILV / LV-Nr: MDS.3 / 2.Semester / ECTS: 3 The following content is discussed in the course: - Intercultural competence - Discussion with representatives from the field
	Ethics, Compliance & Legal Regulations /ILV / LV-Nr: MDS.4 / 4.Semester / ECTS: 3 The following content is discussed in the course: - Data protection (e.g. DSGVO) - Privacy (e-Privacy Regulation) - Handling of data from an ethical/moral point of view - Compliance
	Integrated Application Project /PT / LV-Nr: MDS.4 / 3.Semester / ECTS: 4 In this course, students work on a real, data-centred project along the entire data value chain (from data collection, integration and storage to analysis and utilization of the data). This allows them to try out the skills they have built up in the first two semesters in a real setting and gain new insights
	Data Science for Business & Commerce /ILV / LV-Nr: MDS.5 / 3.Semester / ECTS: 4 The following content is discussed in the course: - CRM on the strategic level - CRM in process management - CRM on the operative level (CRM software systems) - Operative CRM - Analytical CRM - Communicative CRM This course is offered as an elective course together with the Master's Course in Web Communication and Information Systems.
	Data Science for Engineering & Natural Sciences /ILV / LV-Nr: MDS.6 / 3.Semester / ECTS: 4 The following exemplary contents are discussed in the course: - Biology (e.g. genome research, medical diagnostic procedures, etc.) - Physics (e.g. object recognition through image data processing, etc.) - Chemistry (e.g. processing of data-intensive experiments, etc.) - Data-driven maintenance (e.g. predictive maintenance, Digital Twin) - Data-optimized product design (e.g. design of product properties by KNN) - Evaluation of sensor data (e.g. obstacle detection, obstacle avoidance, prediction, etc.) - Cloud-based IoT systems (data storage and collection) - sensor evaluation via Raspberry Pi, Arduino, radio systems
Teaching and learning methods	Leadership, Team & Project Management /ILV / LV-Nr: MDS.1 / 1.Semester / ECTS: 2

	The following methods are used: - Lecture with discussion - Interactive workshop - Case studies

Teaching and learning methods	
	Systemic Innovation /ILV / LV-Nr: MDS.2 / 1.Semester / ECTS: 2 The following methods are used: - Lecture with discussion - Case studies
	Study Trip /ILV / LV-Nr: MDS.3 / 2.Semester / ECTS: 3 The following methods are used: - Interactive workshop - On-site visits with discussion
	Ethics, Compliance & Legal Regulations /ILV / LV-Nr: MDS.4 / 4.Semester / ECTS: 3 The following methods are used: - Lecture with discussion
	Integrated Application Project /PT / LV-Nr: MDS.4 / 3.Semester / ECTS: 4 Coaching within the framework of project implementation
	Data Science for Business & Commerce /ILV / LV-Nr: MDS.5 / 3.Semester / ECTS: 4 The following methods are used: - Lecture with discussion - Interactive workshop - Case studies
	Data Science for Engineering & Natural Sciences /ILV / LV-Nr: MDS.6 / 3.Semester / ECTS: 4 The following methods are used: - Lecture with discussion - Interactive workshop - Case studies
Evaluation Methods Criteria	Leadership, Team & Project Management /ILV / LV-Nr: MDS.1 / 1.Semester / ECTS: 2 Seminar thesis
	Systemic Innovation /ILV / LV-Nr: MDS.2 / 1.Semester / ECTS: 2 Seminar thesis
	Study Trip /ILV / LV-Nr: MDS.3 / 2.Semester / ECTS: 3 Final report
	Ethics, Compliance & Legal Regulations /ILV / LV-Nr: MDS.4 / 4.Semester / ECTS: 3 Written exam
	Integrated Application Project /PT / LV-Nr: MDS.4 / 3.Semester / ECTS: 4 Project documentation
	Data Science for Business & Commerce /ILV / LV-Nr: MDS.5 / 3.Semester / ECTS: 4 Seminar thesis
	Data Science for Engineering & Natural Sciences /ILV / LV-Nr: MDS.6 / 3.Semester / ECTS: 4 Seminar thesis

Acquisition of skills	- 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.
	Data Visualization & Visual Analytics /ILV / LV-Nr: DPR.3 / 3.Semester / ECTS: 4 The following learning outcomes are developed in the course: - Students will have basic knowledge of data visualization and visual communication. - Students will be able to 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.
	Artificial Intelligence /ILV / LV-Nr: DPR.4 / 3.Semester / ECTS: 4 The following skills are developed in the course: - Students are familiar with different strategies for the implementation of artificially intelligent systems. - Students understand the advantages and disadvantages of the strategies developed and are aware of their chal-lenges. - Students can develop strategies to design artificially intelligent systems for practical use.
	Trends in Data Science /ILV / LV-Nr: DPR.5 / 4.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.
Course contents	Big Data Processing /ILV / LV-Nr: DPR.1 / 3.Semester / ECTS: 4 Students are introduced to the basic features of Big Data. Special attention is paid to the handling of this data and the knowledge acquired is consolidated with examples. Suitable frameworks for solving Big Data problems are presented and worked on in interactive workshops with case studies. Examples of this are as follows: - Apache Hadoop - Apache Spark - Apache Flink - Apache Storm - Apache Samza - Apache Kafka These frameworks will be explained and used with case studies. For this purpose, the centrally-provided Data Labs can be accessed
	No-Code & Low-Code Analysis Platforms /ILV / LV-Nr: DPR.2 / 3.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
	Data Visualization & Visual Analytics /ILV / LV-Nr: DPR.3 / 3.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
	Artificial Intelligence /ILV / LV-Nr: DPR.4 / 3.Semester / ECTS: 4 The following content is discussed in the course: - Reasoning approaches (Roal trees, rule-based expert systems) - Search approaches (depth-first, hill climbing, beam, optimal, branch and bound, A*, games, minimax, and alpha-beta) - Constraint approaches (search, domain reduction, visual object recognition) - Learning approaches (neural nets, back propagation, genetic algorithms, sparse spaces, phonology, near misses, felicity conditions, support vector machines, boosting) - Representation approaches (classes, trajectories, transitions) - Possible applications of artificial intelligence in different contexts - Weak versus strong, artificial intelligence This course is offered together with the Web Communication and Information Systems Master program as an elective course.

	Trends in Data Science /ILV / LV-Nr: DPR.5 / 4.Semester / ECTS: 3 The contents of this course are not set, but will be adapted to the current prevailing trends. Content examples may include:

Course contents	- 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
Teaching and learning methods	Big Data Processing /ILV / LV-Nr: DPR.1 / 3.Semester / ECTS: 4 The following methods are used: - Lecture with discussion - Group work - Interactive workshop
	No-Code & Low-Code Analysis Platforms /ILV / LV-Nr: DPR.2 / 3.Semester / ECTS: 4 The following methods are used: - Lecture with discussion - Processing of exercises - Interactive workshop
	Data Visualization & Visual Analytics /ILV / LV-Nr: DPR.3 / 3.Semester / ECTS: 4 The following methods are used: - Lecture with discussion - Interactive workshop - Case studies
	Artificial Intelligence /ILV / LV-Nr: DPR.4 / 3.Semester / ECTS: 4 The following methods are used: - Lecture with discussion - Interactive workshop
	Trends in Data Science /ILV / LV-Nr: DPR.5 / 4.Semester / ECTS: 3 The following methods are used: - Lecture with discussion - Interactive workshop
Evaluation Methods Criteria	Big Data Processing /ILV / LV-Nr: DPR.1 / 3.Semester / ECTS: 4 Written exam
	No-Code & Low-Code Analysis Platforms /ILV / LV-Nr: DPR.2 / 3.Semester / ECTS: 4 Written exam or seminar thesis
	Data Visualization & Visual Analytics /ILV / LV-Nr: DPR.3 / 3.Semester / ECTS: 4 Written exam or seminar thesis
	Artificial Intelligence /ILV / LV-Nr: DPR.4 / 3.Semester / ECTS: 4 Written exam
	Trends in Data Science /ILV / LV-Nr: DPR.5 / 4.Semester / ECTS: 3 Seminar thesis

Module number:	**Master Thesis & Scientific Work**	**Scope:**	
MWA		**26**	**ECTS**
Degree program	University of Applied Sciences Master's Program Data Science & Intelligent Analytics full-time		
Position in the curriculum	3. Semester		
	4. Semester		
Level	3. Semester: Master's course / 4. Semester: Master's course		
Previous knowledge	3. Semester: 3rd semester: No prerequisites / 4. Semester: No prerequisites		
Blocked	no		
Participant group	Bachelor graduates, beginners		
Literature recommendation	Research Methods & Methodology /SE / LV-Nr: MWA.1 / 3.Semester / ECTS: 2 PRIMARY LITERATURE: - Poser, H. (2001): Wissenschaftstheorie. Eine philosophische Einführung (Ed. 1), Reclam, Dithingen (ISBN: 978-3150181256) SECONDARY LITERATURE: - Franck, N. (2017): Handbuch Wissenschaftliches Arbeiten (Ed. 3), Fischer Taschenbuch Verlag, Frankfurt am Main (ISBN: 978-3825247485)		
	Master Thesis Colloquium /SE / LV-Nr: MWA.2 / 4.Semester / ECTS: 2 PRIMARY LITERATURE: - Franck, N. (2007): Handbuch Wissenschaftliches Arbeiten (Ed. 2), Fischer Taschenbuch Verlag, Frankfurt am Main (ISBN: 978-3596151868)		
	Master Thesis /SE / LV-Nr: MWA.2 / 4.Semester / ECTS: 22 PRIMARY LITERATURE: - Franck, N. (2007): Handbuch Wissenschaftliches Arbeiten (Ed. 2), Fischer Taschenbuch Verlag, Frankfurt am Main (ISBN: 978-3596151868)		
Acquisition of skills	Research Methods & Methodology /SE / LV-Nr: MWA.1 / 3.Semester / ECTS: 2 The following skills are developed in the course: - Students know the rules through which academic methods function. - Students can apply these rules on the basis of a specific project. - Students can write an exposé, coordinating problem definition, research question and methodological approach.		
	Master Thesis Colloquium /SE / LV-Nr: MWA.2 / 4.Semester / ECTS: 2 The following skills are developed in the course: - Students are aware of how scientific reviews are conducted. - Students are also aware of how to present results to a scientific community. - Students can critically question scientific findings.		
	Master Thesis /SE / LV-Nr: MWA.2 / 4.Semester / ECTS: 22 The following skills are developed in the course: - Students can independently write a Master thesis in the field of Data Science. - Students can independently set up and carry out a scientific project.		
Course contents	Research Methods & Methodology /SE / LV-Nr: MWA.1 / 3.Semester / ECTS: 2 Students are introduced to the theory of science and academic methods. The goals of academic methods are dis-cussed and applied to the students' own problems. During the course, the students will therefore develop a first draft exposé for a Master thesis.		
	Master Thesis Colloquium /SE / LV-Nr: MWA.2 / 4.Semester / ECTS: 2 The course accompanies the students while they draft and write their master thesis. The colloquium will therefore present and discuss the question/hypothesis and structure of the Master thesis. In addition, the scientific methodology of the Master thesis is discussed and questioned and advice is given on the formal design of the Master thesis.		
	Master Thesis /SE / LV-Nr: MWA.2 / 4.Semester / ECTS: 22 Students independently draft a project idea for their own Master thesis, describe it in the form of an exposé and submit it to the program management for approval. Students then work on the topic and write a Master thesis, which is submitted for review.		
Teaching and learning methods	Research Methods & Methodology /SE / LV-Nr: MWA.1 / 3.Semester / ECTS: 2		

	The following methods are used: - Lecture with discussion - Interactive workshop

Teaching and learning methods	Master Thesis Colloquium /SE / LV-Nr: MWA.2 / 4.Semester / ECTS: 2 The following methods are used: - Interactive workshop - Lecture with discussion
	Master Thesis /SE / LV-Nr: MWA.2 / 4.Semester / ECTS: 22 The following methods are used: - Coaching within the scope of the Master thesis preparation
Evaluation Methods Criteria	Research Methods & Methodology /SE / LV-Nr: MWA.1 / 3.Semester / ECTS: 2 Exposé on the Master thesis
	Master Thesis Colloquium /SE / LV-Nr: MWA.2 / 4.Semester / ECTS: 2 Final presentation
	Master Thesis /SE / LV-Nr: MWA.2 / 4.Semester / ECTS: 22 Master thesis

Module number:	**Data Processing**	**Scope:**	
DPR		**19**	**ECTS**
Degree program	University of Applied Sciences Master's Program Data Science & Intelligent Analytics full-time		
Position in the curriculum	3. Semester		
	4. Semester		
Level	3. Semester: Master's course / 4. Semester: Master's course		
Previous knowledge	3. Semester: 3rd semester: No prerequisites / 3. Semester: No prerequisites / 3. Semester: not applicable / 4. Semester: none		
Blocked	no		
Participant group	Bachelor graduates, beginners		
Literature recommendation	Big Data Processing /ILV / LV-Nr: DPR.1 / 3.Semester / ECTS: 4 PRIMARY LITERATURE: - Jain, V. K. (2017): Big Data and Hadoop (Ed. 1), Khanna Book Publishing, New Delhi (ISBN: 978-9382609131) - Karau, H.; Warren, R. (2017): High Performance Spark: Best Practices for Scaling and Optimizing Apache Spark (Ed. 1), O'Reilly Media, Farnham (ISBN: 978-1491943205) SECONDARY LITERATURE: - O'Neil, C.; Schutt, R. (2013): Doing Data Science. Straight Talk from the Frontline (Ed. 1), O'Reilly Media, Sebastopol (ISBN: 978-1449358655) - Narkhede, N.; Shapira, G.; Palino, T. (2017): Kafka: The Definitive Guide: Real-Time Data and Stream Processing at Scale (Ed. 1), O'Reilly Media, Farnham (ISBN: 978-1491936160)		
	No-Code & Low-Code Analysis Platforms /ILV / LV-Nr: DPR.2 / 3.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)		
	Data Visualization & Visual Analytics /ILV / LV-Nr: DPR.3 / 3.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 and 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)		
	Artificial Intelligence /ILV / LV-Nr: DPR.4 / 3.Semester / ECTS: 4 PRIMARY LITERATURE: - Winson, P. H. (1992): Artificial Intelligence (Ed. 3), Pearson, (ISBN: 978-0201533774) SECONDARY LITERATURE: - Russell, S.; Norvig, P. (2016): Artificial Intelligence: A Modern Approach, Global Edition (Ed. 3), Addison Wesley, Boston (ISBN: 978-1292153964)		
	Trends in Data Science /ILV / LV-Nr: DPR.5 / 4.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/.		
Acquisition of skills	Big Data Processing /ILV / LV-Nr: DPR.1 / 3.Semester / ECTS: 4 The following skills are developed in the course: - The students are familiar with the special challenges involved in storing and processing large quantities of data (V-model: Volume, Variety, Velocity, Veracity). - Students know the options for meeting these challenges (exemplary systems from the respective areas of the V-model are discussed). - Students can develop and apply appropriate solutions to a specific problem.		

	No-Code & Low-Code Analysis Platforms /ILV / LV-Nr: DPR.2 / 3.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).

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 FHG (Universities of Applied Sciences Act), as amended. Accordingly, the subject-specific admission requirement for a master's degree program at a university of applied sciences is a completed subject-relevant bachelor's degree program at a university of applied sciences or the completion of an equivalent degree program at a recognized domestic or international post-secondary educational institution.

1. Bachelor's degree programs (or equivalent post-secondary educational qualifications) eligible as a basis for admission to this degree program must be **from the field of information technologies**[2] and must include **at least 6 ECTS credits** (total) in the core subject areas of (a) use of computers, (b) database design and management, and (c) software and application development.[3] In addition, eligible bachelor's degree programs (or equivalent post-secondary educational qualifications) should include coverage of the **natural sciences, mathematics, and statistics**,[4] and should specifically include **at least 8 ECTS credits** (total) in the core subject areas of (d) mathematics and (e) statistics.[5] In line with the regulations pertaining to part-time programs for working professionals, documented professional qualifications may be considered in the assessment of these prior educational requirements.

Applicants who are unable to provide evidence of these subject-related requirements through their first degrees can provide evidence of their subject-related qualifications for admission to the master's degree program through suitable third-party professional development credentials in the above-mentioned areas (e.g., certificate courses) or documented professional experience (e.g., through an appropriate certificate of employment). Documentation of the aforementioned relevant qualifications needs to be submitted for review and verification as part of the admissions procedure.

- The degree programs of the University of Applied Sciences Kufstein Tirol provide for continuity between the bachelor's and master's levels in line with the Bologna Process. After successful completion of a bachelor's degree program, graduates should have varied opportunities to pursue a master's degree program both within and outside the University. In line with the above, graduates of the following degree programs at the University of Applied Sciences Kufstein Tirol shall be deemed eligible for the present master's degree program:
    - Coding & Digital Design (formerly Web Business & Technology)
    - Industrial Engineering & Management

2. In the part-time organizational form for working professionals, the languages of instruction are both English and German. In consequence, students from non-German-speaking countries must provide appropriate proof of German language proficiency.

3. In the full-time organizational form, the language of instruction and examinations is exclusively English. Therefore, proof of English language proficiency at a level of at least B2 (CEFR) is required.

4. The Director of Studies of the master's degree program in Data Science & Intelligent Analytics is responsible for assessing applicants' eligibility in line with the above admission criteria.

[2] Based on ISCED 2013, Field of Education and Training number 061 (Information and Communication Technologies (ICTs).
[3] Based on ISCED 2013, Fields of Education and Training number 0611 (Computer Use), 0612 (Database and Network Design and Administration), and 0613 (Software and Applications Development and Analysis).
[4] Based on ISCED 2013, Field of Education and Training number 05 (Natural Sciences, Mathematics and Statistics).
[5] Based on ISCED 2013, Fields of Education and Training number 0541 (Mathematics) and 0542 (Statistics).