

Die Modulbeschreibung sollte direkt über diesen [Link](#) in HISinOne eingepflegt werden.

| Module code     | Module title          | Category                                           |
|-----------------|-----------------------|----------------------------------------------------|
| <b>MAIE2030</b> | Advanced Analytics    | MA                                                 |
|                 | <b>Degree program</b> | MA Software Engineering                            |
|                 | <b>Faculty</b>        | Building Services Engineering and Computer Science |

|                                               |                                                                                                                                                                                                           |
|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module coordinator</b>                     | Prof. Dr. Marcel Spehr                                                                                                                                                                                    |
| <b>Module type</b>                            | Mandatory module                                                                                                                                                                                          |
| <b>Frequency</b>                              | 1x annually in WiSe                                                                                                                                                                                       |
| <b>Recommended semester</b>                   | 2. semester                                                                                                                                                                                               |
| <b>Credit (ECTS-Points)</b>                   | 5                                                                                                                                                                                                         |
| <b>Academic Assessment Method</b>             | Coursework requirement<br><br>PrP = Project / Assignment with presentation<br><br>Seminar paper with practical component on a concrete analytics use case, including semester-long group presentations.   |
| <b>Teaching language</b>                      | English                                                                                                                                                                                                   |
| <b>Admission requirements for this Module</b> | none                                                                                                                                                                                                      |
| <b>Module duration</b>                        | 1 Semester                                                                                                                                                                                                |
| <b>Required Registration</b>                  | Students enrolled in the above-mentioned degree program/standard semester will be registered automatically upon re-enrollment; all other participants, please refer to the information below.<br><br>none |

| Course   |                              | Lecturer  | Type                        | Group Size (max.) | Number of Groups            | Contact hours per week (SWS) | Workload (in h) |            |
|----------|------------------------------|-----------|-----------------------------|-------------------|-----------------------------|------------------------------|-----------------|------------|
|          |                              |           |                             |                   |                             |                              | Face-to-face    | Self-study |
| <b>1</b> | Advanced Analytics           | Spehr     | Seminar                     | 30                | 1                           | 4                            | 60              | 65         |
| <b>2</b> | Titel der Lehrveranstaltung. | Dozent*in | Wählen Sie ein Element aus. |                   | Wählen Sie ein Element aus. |                              |                 |            |
| <b>3</b> | Titel der Lehrveranstaltung. | Dozent*in | Wählen Sie ein Element aus. |                   | Wählen Sie ein Element aus. |                              |                 |            |
| <b>4</b> |                              |           | Wählen Sie ein Element aus. |                   |                             |                              |                 |            |

|                           |                              |           |                             |  |                             |     |     |    |
|---------------------------|------------------------------|-----------|-----------------------------|--|-----------------------------|-----|-----|----|
| 5                         | Titel der Lehrveranstaltung. | Dozent*in | Wählen Sie ein Element aus. |  | Wählen Sie ein Element aus. |     |     |    |
| Sum                       |                              |           |                             |  |                             | 4,0 | 60  | 65 |
| Total Workload for Module |                              |           |                             |  |                             |     | 125 |    |

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| <b>Learning Objectives / Learning outcomes</b> | <b>Students are able to...</b> <ul style="list-style-type: none"> <li>Identify and apply modern analytics methods</li> <li>Formulate and implement compute-intensive tasks appropriately in modern distributed systems (e.g., clusters, cloud environments)</li> <li>Work with application-oriented, integrated systems with a central AI component</li> <li>Independently select suitable tools and methods based on a given analytical problem, acquire the necessary knowledge, and apply them in a goal-oriented manner</li> <li>Independently follow current developments in the field and apply modern methods in everyday project work</li> <li>Assess the interplay between prediction domain, data characteristics, evaluation metrics, and business decisions</li> <li>Describe the background and value chain of analytical data</li> <li>Classify analytical problems and apply methods and tools in a solution-oriented way</li> <li>Use the tools of the Python Data Science stack correctly to solve problems</li> <li>Recognize the societal impact of data collection and analysis systems and critically reflect on their own activities in a broader social context</li> </ul> |
| <b>Contents</b>                                | <ul style="list-style-type: none"> <li>Modern AI algorithms are methodically applied to solve clustering, regression, and classification problems</li> <li>The implementation tool is the Python programming language using the dedicated Data Science stack</li> <li>Use of Python libraries for data analysis and implementation of AI architectures in distributed systems (e.g., Spark)</li> <li>Specific characteristics of streaming systems in the context of AI training</li> <li>Current methods and tools for the analytics pipeline, including descriptive, diagnostic, predictive, and prescriptive processing</li> <li>Approach for defining evaluation metrics and algorithms for problem-solving, based on specific data characteristics and a concrete prediction goal</li> <li>Methods for data anonymization and bias-free model training</li> </ul>                                                                                                                                                                                                                                                                                                                            |
| <b>Literature</b>                              | <ul style="list-style-type: none"> <li>Jake VanderPlas, Python Data Science Handbook: Essential Tools for working with Data</li> <li>Wes McKinney, Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython</li> <li>Joel Grus, Data Science from Scratch: First Principles with Python</li> <li>Peter Bruce et. Al., Practical Statistics for Data Scientists: 50+ Essential Concepts Using R and Python</li> <li>Alex Reinhard, Statistics Done Wrong: The Woefully Complete Guide, 2015</li> <li>Sandy Ryza et al, Advanced Analytics with Spark, 2017</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

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|  | <ul style="list-style-type: none"><li>• Mahmoud Parsian, Data Algorithms: Recipes for Scaling Up with Hadoop and Spark, 2015</li></ul> |
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