# Module Description

**General Information:**

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| Module number: | - |
| Title (dt.): | Energiewirtschaft in Zeiten der Digitalisierung |
| Title (en.): | Energy Business in Times of Digitalization |
| Module level: | Master |
| Abbreviation: | - |
| Subtitle: | - |
| Duration: | One semester |
| Occurrence - summer/winter: | winter |
| Occurrence - regular/irregular: | regular |
| Language: | German/English |
| Credits: | 4 |
| Specialization: | |
| Date: | |
| Location: | |
| FIM-exclusivity: | |

**Workload:**

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| Contact hours: | 30 |
| Self-study hours: | 90 |
| Total hours: | 120 |

**Achievment and assessment methods:**

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| Description of achievment and assessment methods: | The module examination is based on a written exam. The written exam might be replaced by an oral examination, however, if the number of participants is low. By answering questions in written form, students have to show their understanding of today's energy system and of concepts and approaches in the areas of smart grid, smart factory, smart mobility, and smart home. By doing calculations, students also have to demonstrate their ability to work with and apply the mathematical methods presented during the lectures and the tutorials. They also have to discuss the presented concepts and approaches. Students can bring a non-programmable and non-finance calculator, and two self-prepared (hand- or machine-written) double-sided DIN-A4 sheets with notes (i.e., 4 pages with notes). Papers discussed in class can be brought to the exam as long as they do not contain any notes (highlights are allowed). |
| Type of assessment: | Written |
| Duration of assessment (min): | 90 min |
| Assessment retake: | End of semester |

**Description:**

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| (Recommended) prerequisites | - |

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| Content: | In the first part “Understanding Today’s Energy System”, students learn about physical and technical basics of energy supply, energy transmission, and energy demand. Moreover, we discuss how these basics influence electricity markets, and we evaluate the potential and challenges of electric mobility. ▫<br>In the second part “Energy Business in Times of Digitalization”, students learn and discuss how digitalization can help overcome challenges introduced by the Energiewende. The lecture presents insights from the areas of Smart Grid, Smart Factory, Smart Mobility, and Smart Home. For example, students learn about novel approaches to adapt production in energy-intensive industries to volatile electricity generation from renewable energy sources – a challenge we currently address with our large-scale research project SynErgie. |
| Intended learning outcomes: | The lecture “Energy Business in Times of Digitalization” discusses challenges and changes the Energiewende introduces to electric grids, industry, transportation, and residential homes. Moreover, students learn how digitalization can help overcome these challenges and facilitate a largely electric and renewable energy system. We discuss amongst others, the potential and challenges of electric mobility, flexibility in energy-intensive industries, and energy efficiency measures. At the end of the course, students understand the key challenges of the Energiewende. Moreover, they know potential solutions that digitalization, information technologies, and information systems can offer for these challenges. Based on this knowledge, students can evaluate and classify basic techno-economic issues in the context of energy management.<br>Besides lecture-style teaching, we use interactive elements such as discussions of current digital trends, joint analysis of scientific papers, and exercises. Students thus not only acquire theoretical knowledge but also gain practically relevant qualifications. The lecture prepares students for jobs in strategic IT management, energy management, consulting, research or business model development, energy-start-ups, utilities, and energy-related companies. |

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| Teaching and learning methods: | The course consists of lectures and complementary tutorials. We introduce the material during the lectures and illustrate it by practical examples. During the tutorials, we examine selected topics and concrete examples in more detail. For self-study purposes, we indicate references repeatedly throughout the course.<br>The exercises are available online on the Moodle platform before each tutorial, and we develop solutions collaboratively with the students during the tutorials. However, students should prepare for the exercises in advance to identify questions and to allow for detailed discussions of the identified issues. Students can prepare the exercise sheets either individually or together in a group. The best preparation for the exam is regular attendance, active participation in class (i.e., lectures, guest lectures and tutorials), and thorough preparation of the exercises discussed during the tutorials. To encourage continuous attendance of the tutorials, we do not provide written solutions for the exercises. In the lectures, we discuss topics from a scientific and often quantitative perspective. Students should thus have a basic understanding of mathematical and statistical models. They should also be willing to follow mathematical reasoning and comprehend quantitative research papers. Moreover, we present different approaches and methods to assess various real-world problems and show how scientific results can inform real-world applications. |
| Media: | Presentation slides, white board, exercise sheets, videos, discussions |
| Reading list: | Fridgen, G., Kahlen, M., Ketter, W., Rieger, A., Thimmel, M.: One rate does not fit all: An empirical analysis of electricity tariffs for residential microgrids<br><br>Fridgen, G., Rieger, A., Thummert, R., Kahlen, M., Ketter, W.: Estimating the Benefits of Cooperation in a Residential Microgrid: A Data-Driven Approach<br><br>Fridgen, G., Häfner, L., König, C., Sachs, T.: Providing Utility to Utilities: The Value of Information Systems Enabled Flexibility in Electricity Consumption<br><br>Weibelzahl, M., Märtz, A.: On the Effects of Storage Facilities on Optimal Zonal Pricing in Electricity Markets<br><br>Buhl, H. U., Gaugler, T., Mette, P.: The "Insurance Effect" : How to increase the Investment Amount in Green Buildings ; A Model-Based Approach to reduce the Energy Efficiency Gap |

**Responsible for module:**

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| First name: | Gilbert, Prof. Dr. |
| Name: | Fridgen |
| Email: | gilbert.fridgen@fim-rc.de |

**Lecturer:**

1. Lecturer:

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| First name: | Gilbert, Prof. Dr. |
| Name: | Fridgen |
| Email: | gilbert.fridgen@fim-rc.de |

**Courses:**

1. Course:

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| Type: | Lecture |
| Name: | Energy Business in Times of Digitalization |
| Weekly hours per semester: | 1,5 |

2. Course:

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| Type: | Excercises |
| Name: | Energy Business in Times of Digitalization |
| Weekly hours per semester: | 0,5 |

**(Recommended) audience:**

1. Program:

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| Name: | MSc Finance & Information Management (FIM) |

2. Program:

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4. Program:

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| Name: | |

5. Program:

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| Name: | |