Modul: Introduction to Energy System Modelling and Optimization

Studiengang/course:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbezeichnung / module name:	Introduction to Energy System Modelling and Optimization
ggf. Kürzel / abbreveation	IESMO
ggf. Untertitel / subtitle	
ggf. Lehrveranstaltungen / seminar:	Introduction to Energy System Modelling and Optimization
Semester / semester:	1st semester
Modulverantwortliche(r) / person in charge of module:	
Dozent(in) / person teaching the seminar:	Clemens Wingenbach / Simon Hilpert
Sprache / language:	Englisch / Deutsch
Zuordnung zum Curriculum / attribution to courses:	M. Eng. Energie- und Umweltmanagement / M.Eng. Energy and Environmental Management Elective Course for the first semester M.Eng.
Lehrform / SWS / form of seminar / teaching hours per week:	Seminar and weekly excercise
Arbeitsaufwand / student workload:	50 hours of teaching and 100 hours of student work
Kreditpunkte / credit points:	5
Voraussetzungen / preconditions:	Admission to the M. Eng. Energy and Environmental Management
Lernziele / Kompetenzen / aims of the module / competencies:	Students will learn the fundamentals and basic skills for the modelling and optimization of energy systems. They will gain a basic knowledge in working with complex data, different modelling approaches and a high-level programming language (python). They will learn how to prepare, process, and verify large amounts of data, develop and implement algorithms, and visualize and analyse the results. Competencies covered: • Engineering informatics • Problem solving • Analytical thinking • Economic competence • Technical competence • Ecological competence • Methodological competence • Self organisation and teamwork • Project organising skills • Academic writing

Inhalt / subjects covered:	The following topics will be covered in the module: • Introduction to working with complex data • Introduction to working with a high-level programming language (python) • Validation of data • Processing Data • Introduction to optimization and solvers • Applying skills on an example from the field of energy • Analysis of the results • Visualisation of the results • Working on an own example • Potentials of Open Source Software and Open Data
Studien-Prüfungsleistungen / form of examination:	Multiple assignments Grading based on final report: Solving an own problem from the field of energy modelling and optimization including processing data, writing code and interpretation of the result with the help of visual representation: - student work during the semester parallel to the course - each student has her/his own problem but help is given during the exercises - report with problem description, methodology, analysis and interpretation including graphics Evaluation criteria: clearly presented / source code is comprehensible and well commented / format of the three pages and list of references / one graphic representation that shows the basic conclusion
Medienformen / media used:	Lectures with beamer based presentations and interactive exercises
Literature / basic literature for the module:	Reddy (2011) Applied Data Analysis and Modeling for Energy Engineers and Scientists. Springer. Kallrath (2012) Gemischt-Ganzzahlige Optimierung: Modellierung in der Praxis. Springer. Kallrath et al. (2009) Optimization in the Energy Industry. Springer.