Modul 7: Applied Informatics in Energy Planning

Studiengang / course:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbezeichnung / module name:	Applied Informatics in Energy Planning
ggf. Kürzel / abbreveation	AIEP
ggf. Untertitel / subtitle	-
ggf. Lehrveranstaltungen / seminar:	-
Semester / semester:	Spring term
Modulverantwortliche(r) / person in charge of module:	Dipl.-Ing. Wulf Boie
Dozent(in) / person teaching the seminar:	Dipl.-Ing. Wulf Boie
Sprache / language:	English
Zuordnung zum Curriculum / attribution to courses:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management For 'Industrial Countries': core elective For 'Developing Countries': compulsory
Lehrform / SWS / form of seminar / teaching hours per week:	Seminar with group work on a case study 4 SWS
Arbeitsaufwand / student workload:	60 contact hours 90 hours individual work
Kreditpunkte / credit points:	5 ECTS
Voraussetzungen nach Prüfungsordnung/ preconditions according to examination regulations:	none
Modulziele / angestrebte Lernergebnisse / aims of the module / aspired learning outcome:	The overall goal of the module is to enable students to assess energy supply and demand scenarios with the help of state of the art computer software for the analysis of energy systems. **Specific Objectives** The participants • understand and are able to analyse energy statistics • understand and are able to apply the basic parameters for power planning, such as capacity factors, availability, capacity credits, load curves, merit orders etc. • are able to develop demand projections applying econometric and end use models • have an overview of energy accounting, optimisation and simulation software, their characteristics, advantages and disadvantages and an in depth knowledge of the Long Range Energy Alternative Planning (LEAP) software
Inhalt / subjects covered:	After an introduction into the basic terms of energy modelling and some of the most common modelling software on the market the module emphasises on the elaboration of a case study, applying the LEAP software.

	For the case study one of the home countries of the students will be selected to make the elaboration of the energy model as practical as possible. The module follows the following structure: • Introduction into energy statistics and energy data sources • Introduction into energy modelling and energy modelling software • Overview of different accounting, optimisation and simulation software such as LEAP, TIMES, MARKAL, Enpep/Balance • In depth introduction into LEAP • Energy Demand: Hierarchical accounting of energy demand (activity levels, energy intensities) • Energy Conversion: Simulation of any energy conversion sector (electric generation, transmission and distribution, CHP, oil refining, charcoal making, coal mining, oil extraction, ethanol production, etc.) • Electric system dispatch • Exogenous and endogenous modeling of capacity expansion • Energy Resources: base year resource, yields, imports and exports. • Systems Costs: capital, O&M, fuel, costs of saving energy, environmental externalities • Environment: Emissions and direct impacts of energy system. • Non-energy sector sources and sinks • Scenarios and evaluation of scenarios • Case studies (in groups of 3-4 students) • Identification of energy data of home countries of the participants • Selection of countries for the case studies based on availability of data • Organising the energy data for the case study, filling gaps • Elaborating a reference demand and supply scenario • Elaborating alternative scenarios • Comparing and analysing alternative scenarios
Studien- Prüfungsleistungen / form of examination:	Report (approx. 15 pages per student) and presentation (approx. 15 min. per student) of alternative energy scenarios as a group work with assessment of the team performance as well as the individual performance
Medienformen / media used:	Black-/ whiteboard, power point presentations, computers for introductory exercises and case studies
Literatur / literature:	- *D. Connolly*, *H. Lund*, *B.V. Mathiesen* and *M. Leahy*, A *review* of *computer tools* for *analysing* the *integration* of *renewable energy into various energy systems*, Applied Energy 87 (2010) -

	- Brian C. O'Neilla, Mausami Desaib, Accuracy of past projections of US energy consumption, Energy Policy 33 (2005) 979–993 - Paul P. Craig, Ashok Gadgil and Jonathan G. Koomey: What can history teach us? A Retrospective Examination of Long-Term Energy Forecasts for the United States, Annu. Rev. Energy Environ. 2002. 27:83–118 - - Coordinated use of energy system models in energy and climate policy analysis - lessons learned from the Nordic Energy Perspectives project (April 2010) - - Bhattacharyya, Timilsina (2010):A review of energy system models, Development Research Group, The World Bank - - SEIB Stockholm Environmental Institute: LEAP Long-range Energy Alternatives Planning System – User Guide, Boston (USA) (latest edition) - SEIB Stockholm Environmental Institute (2003): LEAP Long-range Energy Alternatives Planning System – Training Exercises, Boston (USA) - OECD/IEA (2004): Energy Statistics Manual - - UNEP/Risoe International Laboratory (1997): Integrated resource Planning - - International Energy Agency: World Energy Outlook (latest edition) - - International Energy Agency: Non-OECD Energy Balances (latest edition)