Modul 38: Rational Use of Energy and Renewable Energy Applications

Studiengang / course:	M.Eng. Energie- und Umweltmanagement / M.Eng. Energy and Environmental Management
Modulbezeichnung / module name:	Rational Use of Energy and Renewable Energy Applications
ggf. Kürzel / abbreveation	RUEREA
ggf. Untertitel / subtitle	-
ggf. Lehrveranstaltungen / seminar:	-
Semester / semester:	The module takes place in the second semester and is offered once in a year.
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. Energy and Environmental Management for ‚Developing Countries'; Core Elective Course
Lehrform / SWS / form of seminar / teaching hours per week:	- Rational Use of Energy and Energy Auditing: 2.5 SWH, seminar, max. 24 students/group - Project Exercise: Energy Audit/Energy Retrofit Concept: 1.5 SWH project, max 8 students/group The seminar consists of inputs through lectures and moderated working sessions. Small individual and group exercises allow the students to practice the knowledge acquired from these inputs. The participants have to do a part of these exercises as homework. The successful submission of the homework is a precondition for admission to the module exam. In addition the students have to prepare a small presentation on a selected technical topic . This can be done in small groups or individually, depending on the topic. A fine-tuning of the seminar contents will take place at the begin of the seminar in order to incorporate the knowledge and experience of students who dispose of professional experience in the fields concerned. The seminar is complemented by a project exercise. During the project exercise the student either - design and carry out an energy audit in a small to medium size public building in Flensburg or - develop a concept for an energy retrofit for a building in a tropical country. The data for this project will be supplied by alumni, working in the building sector. For this purpose, they form teams of 3-5 students, assign a team leader and responsibilities for the different topics to be covered by the audit, resp. the energy retrofit concept (usually lighting, appliances, HVAC and

	application of renewable energy on small scale). The exercise results in a report, which has to be presented by the students.
Arbeitsaufwand / student workload:	Lectures: 36 contact hours, 30 hours self study Project Exercise: 24 contact hours, 60 hours self study
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 the students to assess the energy efficiency of small and medium premises, to carry out energy audits and propose appropriate energy saving measures. Specific objectives The students - are aware of the relevance of energy efficiency as a resource in sustainable energy systems - have basic knowledge of energy efficient technologies for small and medium scale residential and commercial premises - know the relevant sources of information on energy efficient technologies - have developed the skills to access information on energy efficiency through internet, literature and personal contacts - know and are able to apply energy auditing methodologies - are able to write up and present an energy audit report - have improved their ability to work in a team
Inhalt / subjects covered:	The module provides the basic knowledge and skills to assess the energy efficiency of small and medium premises, to carry out energy audits and propose appropriate energy saving measures. • Introduction - Trends of energy consumption and energy intensity globally and in selected countries - The role of energy efficiency in the evolution of energy intensity - Technical and economical potential of energy efficiency - The energy flow: from primary energy to energy service - Demand Side Management • Energy Auditing - Energy management in facilities: structure and management targets - Energy indexes as a basis for energy accounting - Methodologies of Energy Auditing • Technical aspects - Lighting - Electrical Appliances in Households and Offices - Electrical motors

	- Heating, Ventilation and Air Conditioning • Practical Exercise: Energy Audit in a small or medium size building - Planning and conducting an Energy Audit - Developing an energy retrofit concept - Writing up a Report - Presenting Results
Studien- Prüfungsleistungen / form of examination:	Each group will present their results in the last week of the semester and submit a project report, based on the weekly progress reports (6-8 pages per student). The individual contributions to the report have to be distinguishable. Assessment - Group mark for final presentation and documentation: 40% - Individual mark for final presentation and documentation: 60%
Medienformen / media used:	Media • Power point presentation, Flip chart, Pin board, calculation simulation software, Measuring Instrument for energy audits, • Handouts, e-books, exercises, weblinks available on BSCW-server
Literatur / literature:	Thumann, P.E. (2013): Handbook of Energy Auditing, 9th Edition (e-book) Benya, James R. und. Leban, Donna J (2011): Lighting Retrofit and Relighting: A Guide to Energy Efficient Lighting (e-book) Haines, Roger W.: Myers, Michael E. (2010) HVAC systems design handbook Howell, Ronald Hunter (2009): Principles of heating, ventilating, and air conditioning: a textbook with design data based on the 2009 ASHRAE Handbook - fundamentals, ASHRAE, Atlanta Koenigsberger, O. H, et al (2011): Manual of Tropical Housing and Building: Climatic Design. Publisher: Universities Press Hyde, Richard (2000): Climate Responsive Design: A Study of Buildings in Moderate and Hot Humid Climates, Taylor & Francis (A more specific bibliography on the different aspects of energy auditing will be distributed at the begin of the seminar)