Universität Flensburg
Flensburg University

Anhang B

zum

Selbstbericht des gemeinsamen, konsekutiven Studiengangs Energie- und Umweltmanagement (Master-Studiengang)

Version 2.00 15. September 2011

Inhaltsverzeichnis

Inhalte des Anhang B

Anhang B, Kapitel 1

Modulhandbuch

zum

Gemeinsamen Selbstbericht der

Universität Flensburg

und der

Fachhochschule Flensburg

zur

Reakkreditierung des gemeinsamen, konsekutiven Studiengangs

Energie- und Umweltmanagement

(Master-Studiengang)

Flensburg, den 15. September 2011

Modulhandbuch für den Studiengang M. Eng. Energie- und Umweltmanagement

Modul 1: Energiemanagement

Studiengang:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbezeichnung:	Energiemanagement
ggf. Kürzel	EM
ggf. Untertitel	-
ggf. Lehrveranstaltungen:	-
Semester:	1. Sem
Modulverantwortliche(r):	Prof. Dr.-Ing. Gerd Hagedorn
Dozent(in):	Prof. Dr.-Ing. Gerd Hagedorn
Sprache:	Deutsch
Zuordnung zum Curriculum	M. Eng. Energie- und Umweltmanagement Pflichtveranstaltung 1. Sem.
Lehrform / SWS:	Vorlesung (Übung)/ 4 SWS
Arbeitsaufwand:	Präsenzstudium: 60h Eigenstudium: 90h
Kreditpunkte:	5
Voraussetzungen:	Grundlagen Energietechnik, Energiemanagement
Modulziele / angestrebte Lernergebnisse / Kompetenzen:	Vertiefte Kenntnisse zur Vorgehensweise und in der Anwendung von Methoden des Energiemanagements, die zu einer Reduzierung des Endenergieeinsatzes in den Anwendungssektoren für die Deckung des Nutzenergiebedarfs führen.
Inhalt:	1. Einführung und Grundbegriffe 2. Energiemanagementsysteme (DIN EN 16001) 3. Vorgehensweise betriebliches Energiemanagement 4. Gewinnen und Verarbeiten energetischer Daten 5. Benchmarking/Vergleich von Energiekennzahlen 6. Erstellen von Stoff-, Leistungs- und Energiebilanzen 7. Erstellen von Betriebskennlinien 8. Auswahl und Priorisierung von Maßnahmen 9. Querschnittstechnologien 10. Raumheizung und Klimatisierung 11. Energieanwendung im Verkehr (Transportwesen)
Studien- Prüfungsleistungen:	Klausur (120 min)
Medienformen:	Pdf-Versionen von VL-Skript, UE-Aufgaben und zahlreichen Publikationen (download), Powerpoint-Präsentationen/Folien, Tafel
Literatur:	Rudolph, M.; Wagner, U. Energieanwendungstechnik – Wege und Techniken zur effizienteren Energienutzung Springer-Verlag, 2008

Modul 2: Green Engineering Theory

Studiengang / course:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbezeichnung / module name:	Green Engineering Theory
ggf. Kürzel / abbreviation	
ggf. Untertitel / subtitle	
ggf. Lehrveranstaltungen / seminar:	Green Engineering Theory
Semester / semester:	1st Semester (summer term)
Modulverantwortliche(r) / person in charge of module:	Prof. Dr. Jens Born
Dozent(in) / person teaching the seminar:	Prof. Dr. Jens Born
Sprache / language:	English
Zuordnung zum Curriculum / attribution to courses:	M. Eng. Energy and Environmental Management 1st Semester Compulsory Course
Lehrform / SWS / form of seminar / teaching hours per week:	Project and Workshop 4 teaching hours per week
Arbeitsaufwand / student workload:	Attendance: 60 h Private study: 90 h
Kreditpunkte / credit points:	5 ECTS
Voraussetzungen nach Prüfungsordnung/ preconditions according to examination regulations:	B.Sc. or B.Eng.
Modulziele / angestrebte Lernergebnisse / aims of the module / aspired learning outcome:	Knowledge of approaches and methods: • to evaluate and optimize the sustainability of chemical transformations and products • to design processes with sustainable and minimal resource consumption, considering special features of renewable resources
Inhalt / subjects covered:	– Ecological effects and concepts of risk – Evaluating and Optimizing the ecological performance of processes – Unit operations considering environmental criteria – Process integration to enhance sustainability – Applying flowsheet and eco-balancing methods – Renewable energies – features and strategies for sustainable usage, storage and transformation – Miniprojects to the mentioned subjects
Studien- Prüfungsleistungen / form of examination:	Presentation and written report
Medienformen / media used:	Blackboard, Power Point Presentation
Literatur / literature:	➢ Allen, Shonnard: Green Engineering ➢ Graedel, Allenby: Industrial Ecology and Sustainable Engineering ➢ Hill: Sustainable Resource Use

Modul 3: Green Engineering Project

Studiengang / course:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbezeichnung / module name:	Green Engineering Project
ggf. Kürzel / abbreviation	
ggf. Untertitel / subtitle	
ggf. Lehrveranstaltungen / seminar:	Green Engineering Project
Semester / semester:	2nd Semester (winter term)
Modulverantwortliche(r) / person in charge of module:	Prof. Dr. Jens Born
Dozent(in) / person teaching the seminar:	Prof. Dr. Jens Born
Sprache / language:	English
Zuordnung zum Curriculum / attribution to courses:	M. Eng. Energy and Environmental Management 2nd Semester Core Elective Course
Lehrform / SWS / form of seminar / teaching hours per week:	Project and Workshop 4 teaching hours per week
Arbeitsaufwand / student workload:	Attendance: 60 h Private study: 90 h
Kreditpunkte / credit points:	5 ECTS
Voraussetzungen nach Prüfungsordnung/ preconditions according to examination regulations:	B. Sc.
Modulziele / angestrebte Lernergebnisse / aims of the module / aspired learning outcome:	– Ability to apply scientific methods of Green Engineering to solve procedural problems – Ability to solve problems fulfilling sustainability criteria – Ability to design processes in a step-by-step approach – Practice in applying commonly accepted software for process design and eco-balancing – Ability to manage more complex projects
Inhalt / subjects covered:	– Varying assignments on the integration of process chains fulfilling criteria of energy and resource efficiency – Integration of renewable energy, waste and wastewater treatment in respective process chains – Project work: design of sustainable and integrated process chains and cascade utilizations – Integration of process chains – Feed-back and discussion of approaches chosen, solution of occurring problems during workshops – Oral and written presentation of results
Studien- Prüfungsleistungen / form of examination:	Presentation and written report
Medienformen / media used:	CPE Software, Blackboard, Power point Presentation
Literatur / literature:	➢ Allan, Shonnard: Green Engineering ➢ Graedel, Allenby: Industrial Ecology and Sustainable Engineering

Modul 4: Energy Storage Systems

Studiengang / course:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbezeichnung / module name:	Energy Storage Systems and Integration
ggf. Kürzel / abbreviation	ESS
ggf. Untertitel / subtitle	
seminar:	
Semester / semester:	2.
Modulverantwortliche(r) / person in charge of module:	Prof. Dr. Jens Born
Dozent(in) / person teaching the seminar:	Prof. Dr. Jens Born
Sprache / language:	English
Zuordnung zum Curriculum / attribution to courses:	M. Eng. Energy and Environmental Management 2nd Semester Core Elective Course
Lehrform / form of seminar / teaching h. per week:	Workshop 4 teaching hours per week
Arbeitsaufwand / student workload:	Attendance: 60 h Private study: 90 h
Kreditpunkte / credit points:	5 ECTS
Voraussetzungen nach Prüfungsordnung/ preconditions according to examination regulations:	B. Sc. or B. Eng.
Modulziele / angestrebte Lernergebnisse / aims of the module / aspired learning outcome:	Knowledge of the functioning, properties, and application of physical-chemical energy storage systems Knowledge of integration options of storage technologies into other processes of regional self-supply and industrial energy supply.
Inhalt / subjects covered:	Electrochemical systems - Fundamentals - Capacitors - Batteries - Fuel cells - Osmotic power plants Chemical Storage systems - Fundamentals - Hydrogen and Electrolysis - Methane und methanation - Methanol Integration - Fundamentals - Bio energy as complementary energy - Temporary CCS - Regional self-supply - Base load supply of chemical industry
Studien- Prüfungsleistungen / form of examination:	Presentation and semester paper
Medienformen / media used:	Blackboard, Power Point Presentation

Literatur / literature:	• Huggins: Energy Storage; Springer; 2010

Modul 5: Werkstoffe I

Studiengang:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbezeichnung:	Werkstoffe I
ggf. Kürzel	WST-1
ggf. Untertitel	
ggf. Lehrveranstaltungen:	
Semester:	1 oder 2
Modulverantwortliche(r):	Fachbereich Technik Prof. Dr. rer. nat. Lothar Machon
Dozent(in):	Prof. Dr. rer. nat. Lothar Machon Prof. Dr. rer. nat. Michael Dahms
Sprache:	Deutsch
Zuordnung zum Curriculum	M. Sc. Energie- und Umweltmanagement Wahlpflichtveranstaltung 1. oder 2. Sem.
Lehrform / SWS:	Vorlesung, Projekt- bzw. Hausarbeit 4 SWS
Arbeitsaufwand:	Präsenzstudium: 60 h Eigenstudium: 90 h
Kreditpunkte:	5
Voraussetzungen:	keine
Lernziele / Kompetenzen:	Die Studenten vertiefen ihr Wissen über die Synthese, Verarbeitung und Anwendung von Werkstoffen unter besonderer Berücksichtigung des Energieaufwands und der Auswirkungen auf die Umwelt. Die Betrachtung erfolgt im Zusammenhang industrieller Produktionslinien einschließlich der Rückführung in die Produktion (Recycling) und der hierzu angewandten Verfahren. Die Kenntnisse werden genutzt, um eine umfassende Problemstellung aus dem Bereich "Ressourcenschonender Werkstoffeinsatz" eigenständig zu bearbeiten.
Inhalt:	Synthese, Verarbeitung, Anwendung und Recycling von Werkstoffen.
Studien- Prüfungsleistungen:	Klausur / Testat über erfolgreiche Durchführung der Projekt- bzw. Hausarbeit
Medienformen:	Tafel Folien PC / Beamer e-learning-Plattform Internet
Literatur:	Bergmann: Werkstofftechnik Teil 2: Anwendung Berns: Stahlkunde für Ingenieure Domininghaus: Die Kunststoffe und ihre Eigenschaften Ehrenstein: Faserverbund-Kunststoffe, Werkstoffe, Verarbeitung, Eigenschaften Riedel: Allgemeine und Anorganische Chemie Schatt: Konstruktionswerkstoffe des Maschinen- und Anlagenbaues

Modul 6: Werkstoffe II

Studiengang:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbezeichnung:	Werkstoffe II
ggf. Kürzel	WST-2
ggf. Untertitel	
ggf. Lehrveranstaltungen:	1. Hochtemperaturwerkstoffe 2. Bruchmechanik
Semester:	1 oder 2
Modulverantwortliche(r):	Fachbereich Technik Prof. Dr-Ing. Michael Dahms
Dozent(in):	1. Prof. Dr-Ing. Michael Dahms 2. Dr.-Ing. Uwe Zerbst
Sprache:	Deutsch
Zuordnung zum Curriculum	M. Eng. Energie- und Umweltmanagement Wahlpflichtveranstaltung 1. oder 2. Sem.
Lehrform / SWS:	Vorlesungen 4 SWS
Arbeitsaufwand:	Präsenzstudium: 60 h Eigenstudium: 90 h
Kreditpunkte:	5
Voraussetzungen:	Keine
Lernziele / Kompetenzen:	Die Studenten vertiefen ihr Wissen über zwei im Energie- und Umweltmanagement wichtige Spezialgebiete der Werkstoffkunde - Bruchmechanik und Hochtemperaturwerkstoffe. zu 1.: Die Studierenden sollen in der Lage sein, für Hochtemperaturanwendungen, insbesondere in der Energietechnik, gezielt Werkstoffe auswählen als auch verwendete Werkstoffe bewerten zu können. zu 2.: In der Bruchmechanik werden neben den Grundlagen bruchmechanischer Modellbildung Kenntnisse der Ermittlung bruchmechanischer Werkstoffkennwerte und ihrer Anwendung in Konstruktion und Schadensaufklärung vermittelt.
Inhalt:	zu 1.: Grundlagen des Kriechens Thermische Ermüdung Warmfeste Stähle Nickellegierungen Hochtemperaturkorrosion Hitzebeständige Stähle Kolbenwerkstoffe Ventilwerkstoffe zu 2.: Grundlagen der Bruchmechanik Bruchmechanische Rißspitzenparameter Ermittlung bruchmechanischer Kennwerte Bruchmechanische Berechnung von Bauteilen

Studien- Prüfungsleistungen:	Klausur
Medienformen:	Demonstrationspraktikum Skript Tafel Folien PC / Beamer
Literatur:	Bürgel: Handbuch Hochtemperatur-Werkstofftechnik Schwalbe: Bruchmechanik metallischer Werkstoffe Berns: Stahlkunde für Ingenieure Krautkrämer: Werkstoffprüfung mit Ultraschall Heptner / Stroppe: Magnetische und magnetinduktive Werkstoffprüfung

Modul 7: Schweißtechnik

Studiengang / course:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbezeichnung / module name:	Schweißtechnik
ggf. Kürzel / abbreveation	ST
ggf. Untertitel / subtitle	
ggf. Lehrveranstaltungen / seminar:	Schweißtechnik
Semester / semester:	WS
Modulverantwortliche(r) / person in charge of module:	Prof. Dr-Ing. Michael Dahms
Dozent(in) / person teaching the seminar:	Prof. Dr-Ing. Michael Dahms Dipl.-Ing. Ingo Rausch, SFI
Sprache / language:	Deutsch
Zuordnung zum Curriculum / attribution to courses:	M. Eng. Energie- und Umweltmanagement, Wahlpflicht, Wintersemester
Lehrform / SWS / form of seminar / teaching hours per week:	Vorlesung / 4 SWS
Arbeitsaufwand / student workload:	Präsenzstudium: 60 h Eigenstudium: 90 h
Kreditpunkte / credit points:	5
Voraussetzungen nach Prüfungsordnung/ preconditions according to examination regulations:	keine
Modulziele / angestrebte Lernergebnisse / aims of the module / aspired learning outcome:	Die Studenten erwerben Wissen in einem im Energie- und Umweltmanagement wichtigen Spezialgebiet – Schweißtechnik. Die Inhalte sind so ausgewählt, dass die Studierenden sich die bestandene Klausur als Teil I des internationalen Schweißfachingenieurlehrganges anerkennen lassen können. Damit wird der erste Schritt eines Prozesses absolviert, der den Berufseinsatz des Ingenieurs als Schweißaufsicht o.ä. ermöglicht.
Inhalt / subjects covered:	Hauptgebiet 1: Schweißverfahren Hauptgebiet 2: Schweißen des unlegierten Stahls Hauptgebiet 3: Schweißkonstruktion Die Inhalte orientieren sich am Katalog des internationalen Schweißfachingenieurlehrganges, Teil I.
Studien- Prüfungsleistungen / form of examination:	Klausur (120 min.)
Medienformen / media used:	Skript, Tafel, PC/Beamer, Stud.IP
Literatur / literature:	DVS: Fügetechnik Schweißtechnik (7. Auflage)

Modul 8: Entwicklung und Bewertung energietechnischer Systeme

Studiengang:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbezeichnung:	Entwicklung und Bewertung energietechnischer Systeme
ggf. Kürzel	EBES
ggf. Untertitel	-
ggf. Lehrveranstaltungen:	-
Semester:	2. Sem
Modulverantwortliche(r):	Prof. Dr.-Ing. Gerd Hagedorn
Dozent(in):	Prof. Dr.-Ing. Gerd Hagedorn
Sprache:	Deutsch
Zuordnung zum Curriculum	M. Eng. Energie- und Umweltmanagement Wahlpflichtveranstaltung 2. Sem.
Lehrform / SWS:	Vorlesung/Übung 4 SWS
Arbeitsaufwand:	Präsenzstudium: 60h Eigenstudium: 90h
Kreditpunkte:	5
Voraussetzungen:	Grundlagen Energie- und Umwelttechnik
Modulziele / angestrebte Lernergebnisse / Kompetenzen:	Verständnis des rekursiven Zusammenhangs zwischen Technikbewertung und Technikentwicklung. Vertiefte Kenntnis ausgewählter Bewertungsmethoden und Kennzahlen zur Beschreibung energietechnischer Anlagen und Systeme. Zielgerichtetes Management von komplexen technischen Entwicklungsprozessen unter realen betrieblichen Randbedingungen.
Inhalt:	Teil A: Bewertung 12. Technikbewertung 13. Wirtschaftlichkeit (Lebenszykluskosten) 14. Energieaufwand (Kumulierter Energieaufwand) 15. Umweltverträglichkeit (Lebenszyklusanalyse) 16. Verfügbarkeit 17. Software und Datenbanken 18. Praxisbeispiele Teil B: Entwicklung 1. Effektivität und Effizienz von Entwicklungsprozessen 2. Vorfeldbetrachtungen 3. Markt-, Kunden- und Wettbewerberanalysen 4. Konzept- und Produktplanung 5. Produktentwicklung 6. Produkteinführung und Erfahrungsrückfluss 7. Methodische Instrumente 8. Praxisbeispiele
Studien- Prüfungsleistungen:	Klausur (120 min)
Medienformen:	Pdf-Versionen von VL-Skript, UE-Aufgaben und zahlreichen Publikationen (download), Powerpoint-Präsentationen/Folien, Tafel
Literatur:	Bullinger/Warschat (Hrsg.) Forschungs- und Entwicklungsmanagement, B.G. Teubner Stuttgart Literatur und Internetadressenverzeichnis

Modul 9: Advanced Topics in Renewable Energies

Studiengang / course:	M. Eng. Energie- und Umweltmanagement / M.Eng. Energy and Environmental Management
Modulbezeichnung / module name:	Advanced Topics in Renewable Energies
ggf. Kürzel / abbreviation	
ggf. Untertitel / subtitle	
ggf. Lehrveranstaltungen / seminar:	
Semester / semester:	1st or 2nd semester (summer or winter term)
Modulverantwortliche(r) / person in charge of module:	Prof. Dr. Olav Hohmeyer
Dozent(in) / person teaching the seminar:	Prof. Dr. Torsten Faber Prof. Dr. habil Horst-Günter Rubahn Asst. Prof. Ph.D. Morten Madsen Prof. Dr.-Ing. Ilja Tuschy
Sprache / language:	English
Zuordnung zum Curriculum / attribution to courses:	M. Eng. Energy and Environmental Management 1st or 2nd semester Core Elective Course
Lehrform / SWS / form of seminar / teaching hours per week:	3 teaching hours per week Lectures and laboratory exercises
Arbeitsaufwand / student workload:	Attendance: 45 h Private study: 105 h
Kreditpunkte / credit points:	5 ECTS
Voraussetzungen nach Prüfungsordnung/ preconditions according to examination regulations:	None
Modulziele / angestrebte Lernergebnisse / aims of the module / aspired learning outcome:	Subject-specific in-depth knowledge on advanced topics in wind energy, concentrated solar power, (organic) photovoltaic
Inhalt / subjects covered:	A. (Organic) Photovoltaics B. Wind Energy C. Concentrated Solar Power
Studien- Prüfungsleistungen / form of examination:	Oral presentation and written report
Medienformen / media used:	Power point presentation, blackboard
Literatur / literature:	M. Pagliaro, G. Palmisano and R. Ciriminna *Flexible solar cells, Wiley-VCH*, 2008, ISBN: 978-3-527-32375-3

Modul 10: Fundamentals of Environmental Science

Studiengang / course:	Master of Science – Wind Engineering
Modulbezeichnung / module name:	Fundamentals of Environmental Science
ggf. Kürzel / abbreviation	
ggf. Untertitel / subtitle	
ggf. Lehrveranstaltungen / seminar:	
Semester / semester:	1.
Modulverantwortliche(r) / person in charge of module:	Dr. rer. nat. Hermann van Radecke
Dozent(in) / person teaching the seminar:	Dr. rer. nat. Hermann van Radecke et al.
Sprache / language:	English
Zuordnung zum Curriculum / attribution to courses:	M. Eng. Energy and Environmental Management Core elective course for the first semester M. Eng.
Lehrform / SWS / form of seminar / teaching hours per week:	Course of lectures with practical exercises 4 teaching hours per week
Arbeitsaufwand / student workload:	Attendance: 60 h Private study: 90 h
Kreditpunkte / credit points:	5 ECTS
Voraussetzungen nach Prüfungsordnung/ preconditions according to examination regulations:	None
Modulziele / angestrebte Lernergebnisse / aims of the module / aspired learning outcome:	Through investigation of the effects of wind on wind energy plants the students learn the fundamentals of energy meteorology and through study of the impact of wind energy plants on the environment gain knowledge of types and levels of emissions. Students will be able single-handedly to make and evaluate prognoses of wind-energy potential. They will know and understand the physical, technical and legal aspects of wind energy plants with regard to their emissions. They will be able to calculate emissions and evaluate them in relation to critical values. They will be able to predict whether the installation and operation of projected wind energy plants will comply with the requirements of environmental impact assessments.
Inhalt / subjects covered:	1. Energy meteorology (global and regional wind systems, boundary layers, profile, turbulence, WAsP, mesoscale models, wind atlases, reference outputs according to Technical Directives Parts 5 and 6, long-range dependency (wind index), measurement, short-term forecasts) 2. Emissions and influences on the environment, noise (measurement and calculation), shadow (measurement, calculation, control), critical values, turbulence as a form of emission, landscape aesthetics

	(planning, assessment, visualisation), measurement of environmental data (IEC Directives, Technical Directives) 3. Calculation of environmental data and emissions (Program modules Windpro, Windfarmer, WAsP, et al.) 4. Effects on the surroundings (humans, birds, domestic animals and wildlife, habitats) 5. Environmental impact assessments (critical values, land use, Federal Building Code, Federal Pollution Control Laws, approval procedures)
Studien- Prüfungsleistungen / form of examination:	Written examination
Medienformen / media used:	Blackboard, transparencies, in-class experiments, PC and video projector, e-learning platform, lecture notes
Literatur / literature:	Foken, T.: Angewandte Meteorologie. Springer-Verlag Berlin, 2003 Troen, I. and E.L. Petersen: European Wind Atlas. Risø National Laboratory, Roskilde, 1989 Stull, R.B.: An Introduction to Boundary Layer Meteorology. Kluwer Academic Publishers, 1988 Manwell, J.F., McGowan, J.G., Rogers, A.L.: Wind Energy Explained. Wiley, 2002 Lalas, D.P., Ratto, C.F.: Modelling Atmospheric Flow Fields, World Scientific Pub., 1996 Technische Richtlinien (FGW-Richtlinien) Teil 1 Bestimmung der Schallemissionswerte, Teil 5 Bestimmung und Anwendung des Referenzertrages, Teil 6 Bestimmung von Windpotenzial und Energieerträgen, FGW, Kiel, 1998 ff. Handbücher Programme Windpro und Windfarmer Swift-Hook, D.T. (Edit.): Wind Energy and the Environment. P. Peregrinus Ltd, United Kingdom, 1989

Modul 11: Environmental Science, Advanced

Studiengang / course:	Master of Science – Wind Engineering
Modulbezeichnung / module name:	Environment, Elective (Environmental Science, Advanced)
ggf. Kürzel / abbreviation	
ggf. Untertitel / subtitle	
ggf. Lehrveranstaltungen / seminar:	
Semester / semester:	1.
Modulverantwortliche(r) / person in charge of module:	Dr. rer. nat. Hermann van Radecke
Dozent(in) / person teaching the seminar:	Dr. rer. nat. Hermann van Radecke et al.
Sprache / language:	English
Zuordnung zum Curriculum / attribution to courses:	M. Eng. Energy and Environmental Management Core elective course for the first semester M. Eng.
Lehrform / SWS / form of seminar / teaching hours per week:	Course of lectures with practical exercises 4 teaching hours per week
Arbeitsaufwand / student workload:	Attendance: 60 h Private study: 90 h
Kreditpunkte / credit points:	5 ECTS
Voraussetzungen nach Prüfungsordnung/ preconditions according to examination regulations:	None
Modulziele / angestrebte Lernergebnisse / aims of the module / aspired learning outcome:	Through investigation of the effects of wind on wind energy plants the students will acquire advanced knowledge of energy meteorology and through study of the impact of wind energy plants on the environment gain advanced knowledge of types and levels of emissions. Students will be able single-handedly to make and evaluate prognoses of wind-energy potential. They will know and understand the physical, technical and legal aspects of wind energy plants with regard to their emissions. They will be able to calculate and evaluate emissions. They will be able to predict whether the installation and operation of projected wind energy plants will comply with the approval procedures for land and off-shore plants.
Inhalt / subjects covered:	6. Energy meteorology (global and regional wind systems, boundary layers, profile, turbulence, WAsP, mesoscale models, wind atlases, reference outputs according to Technical Directives Parts 5 and 6, long-range dependency (wind index), measurement, short-term forecasts) 7. Emissions and influences on the environment, noise (measurement and calculation), shadow measurement, calculation, control), critical values, turbulence as a form of emission, landscape aesthetics (planning, assessment, visualisation), measurement of

	environmental data (IEC Directives, Technical Directives) 8. Calculation of environmental data and emissions (Program modules Windpro, Windfarmer, WAsP, et al.) 9. Practical exercises including program modules on subjects such as energy potential, noise and shadow emission and landscape aesthetics 10. Effects on off-shore environments (birds, sea creatures, marine habitats, sea bed) 11. Approval procedures for off-shore installations
Studien- Prüfungsleistungen / form of examination:	To be determined
Medienformen / media used:	Blackboard, transparencies, in-class experiments, PC and video projector, e-learning platform, lecture notes
Literatur / literature:	Foken, T.: Angewandte Meteorologie. Springer-Verlag Berlin, 2003 Troen, I. and E.L. Petersen: European Wind Atlas. Risø National Laboratory, Roskilde, 1989 Stull, R.B.: An Introduction to Boundary Layer Meteorology. Kluwer Academic Publishers, 1988 Manwell, J.F., McGowan, J.G., Rogers, A.L.: Wind Energy Explained. Wiley, 2002 Lalas, D.P., Ratto, C.F.: Modelling Atmospheric Flow Fields, World ScientificPub., 1996 Technische Richtlinien (FGW-Richtlinien) Teil 1 Bestimmung der Schallemissionswerte, Teil 5 Bestimmung und Anwendung des Referenzertrages, Teil 6 Bestimmung von Windpotenzial und Energieerträgen, FGW, Kiel, 1998 ff. Handbücher Programme Windpro und Windfarmer Swift-Hook, D.T. (Edit.): Wind Energy and the Environment. P. Peregrinus Ltd, United Kingdom, 1989 Köller, J. et al (Editors): Offshore Wind Energy, Research on Environmental Impacts. Springer-Verlag, Berlin, 2006 Dahlke, Nolte, Zeiler: "Offshore-Windparks in der AWZ von Nord- und Ostsee", promet, S. 71 ff., 2005

Modul 12: Cleanroom Microfabrication

Studiengang / course:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbezeichnung / module name:	Cleanroom Microfabrication
ggf. Kürzel / abbreviation	
ggf. Untertitel / subtitle	
ggf. Lehrveranstaltungen / seminar:	
Semester / semester:	1st or 2nd semester (summer or winter term)
Modulverantwortliche(r) / person in charge of module:	Prof. Dr. Olav Hohmeyer / Prof. Dr. H.-G. Rubahn
Dozent(in) / person teaching the seminar:	Associate Professor, Ph.D. Jakob Kjelstrup-Hansen
Sprache / language:	English
Zuordnung zum Curriculum / attribution to courses:	M. Eng. Energy and Environmental Management 1st or 2nd semester Core Elective Course
Lehrform / SWS / form of seminar / teaching hours per week:	4 teaching hours per week (option: en-bloc sessions) Lectures and laboratory exercises
Arbeitsaufwand / student workload:	Attendance: 50 h Private study: 100 h
Kreditpunkte / credit points:	5 ECTS
Voraussetzungen nach Prüfungsordnung/ preconditions according to examination regulations:	None
Modulziele / angestrebte Lernergebnisse / aims of the module / aspired learning outcome:	At the end of the course, the student is expected to be able to: • Account for the structure and properties of silicon and the reason for its large prevalence. • Describe the photolithographic process and compare its characteristics to alternative lithography techniques such as electron beam lithography and nanoimprint lithography. • Explain the process of formation of silicon dioxide by thermal oxidation and be able to use a theoretical model to predict the thickness of the resulting silicon dioxide layer. • Account for the most commonly used chemical and physical vapor deposition techniques, describe their operation principles and account for which materials that can be deposited. • Describe both wet and dry etching methods and account for the pros and cons.
Inhalt / subjects covered:	1. Cleanroom technology 2. Silicon a. Crystal structure

	b. Wafer types and properties (sizes, crystal orientations, doping type and concentration, special types – silicon-on-insulator (SOI)) 3. Growth and deposition of thin films a. Growth of silicon dioxide on silicon by thermal oxidation b. Deposition of thin films by chemical vapor deposition (CVD) i. Low pressure CVD ii. Plasma enhanced CVD c. Deposition of thin films by physical vapor deposition i. Evaporation ii. Sputtering 4. Lithography techniques for pattern definition a. Photo lithography b. Electron beam lithography 5. Etching a. Wet etching i. Isotropic etching ii. Anisotropic etching (etching of silicon in KOH) b. Dry etching (reactive ion etching)
Studien- Prüfungsleistungen / form of examination:	Oral presentation
Medienformen / media used:	
Literatur / literature:	J. D. Plummer, M. D. Deal, and P. B. Griffin *Silicon VLSI Technology*, Prentice Hall, 2000, ISBN 0-13-085037-3

Modul 13: 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 / abbreviation	AIEP
ggf. Untertitel / subtitle	
ggf. Lehrveranstaltungen / seminar:	
Semester / semester:	1. semester
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:	EEM industrialized countries: elective EEM developing countries: compulsory
Lehrform / SWS / form of seminar / teaching hours per week:	Seminar with group work on a casestudy 4 contact hours/week
Arbeitsaufwand / student workload:	60 contact hours, 90 hours individual work
Kreditpunkte / credit points:	5 CP
Voraussetzungen nach Prüfungsordnung/ preconditions according to examination regulations:	
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 study - Identification of energy data of the home countries of the participants - Selection of a country for the case study - 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 Current accounts and reference scenario are elaborated with the whole group in order to develop a common basis for the alternative scenarios which are elaborated by smaller working groups of 3-4 students.
Studien- Prüfungsleistungen / form of examination:	Report and presentation 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 - SEIB Stockholm Environmental Institute: LEAP Long-range Energy Alternatives Planning System – User Guide, Boston (USA), 2004 - SEIB Stockholm Environmental Institute: LEAP Long-range Energy Alternatives Planning System – Training Exercises, Boston (USA), 2003 - OECD/IEA (2004): Energy Statistics Manual - UNEP/Risoe International Laboratory (1997): Integrated resource Planning (BSCW) - International Energy Agency: World Energy Outlook 2010 (resp. the latest edition) - International Energy Agency: Non-OECD Energy Balances 2008 (resp. the latest edition)

Modul 14: Energieautomation

Studiengang:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbezeichnung:	Energieautomation
ggf. Kürzel	EAT
ggf. Untertitel	-
ggf. Lehrveranstaltungen:	-
Semester:	2.
Modulverantwortliche(r):	Fachhochschule Flensburg/Fachbereich Technik Prof. Dr.-Ing. J. Wendiggensen
Dozent(in):	Prof. Dr.-Ing. J. Wendiggensen
Sprache:	deutsch
Zuordnung zum Curriculum	Ingenieurinformatik - Pflichtveranstaltung M. Eng. EUM / EEM
Lehrform / SWS:	Vorlesung 3 SWS / Simulationsübungen 1 SWS
Arbeitsaufwand:	Präsenzstudium: 60 h Eigenstudium: 90 h
Kreditpunkte:	5
Voraussetzungen:	Mess- Regelungs- und Automatisierungstechnik
Lernziele / Kompetenzen:	Die Studierenden kennen die Strukturkomponenten moderner Leitsysteme und können diese den verschiedenen leittechnischen Aufgaben zuordnen. Die Studierenden sind in der Lage R/I-Fließbilder zu lesen und verfahrenstechnischen Beschreibungen zusammen mit Aufgabenstellungen in CFC und SFC Plänen zu interpretieren. Sie erhalten einen Überblick über den Aufbau, das Verhalten von Regelungen für energietechnische Komponenten, Leitungsnetze und Kraftwerke und lernen die Konzeption fortgeschrittener Regelkonzepte in energietechnischen Anlagen kennen.
Inhalt:	Überblick über die Ziele und die Historie der Automatisierungstechnik, Begriffsklärung, Darstellung von Aufgabenstellungen in der Automatisierungstechnik, R/I-Fließbilder, Kraftwerks-Kennzeichnungssystem KKS, Strukturkomponenten und struktureller Aufbau von Prozessleitsystemen, Prozessnahe Komponenten, Prozessferne Komponenten, Bussysteme und Kommunikation in der Automatisierungs- und Prozessleittechnik. Primär-, Sekundär- und Tertiärregelung, Modellierung des Netzverhaltens durch ein einfaches Netzdynamikmodell. Modellierung des Kraftwerks- bzw. Regelzonenverhaltens durch die Dynamikvorgaben der entso-e und einfache Kraftwerksmodelle. Regelkonzepte für Kraftwerkskomponenten, Blockführung und Blockregelung. Leistungs- und Pitchregelungen bei WKA. Wechselnde (aktuelle) Themen der Automation im Bereich energietechnischer Systeme. Exkursion.
Studien- Prüfungsleistungen:	Ausarbeitung und Vortrag oder Klausur (benotet)
Medienformen:	Folien (Powerpoint, PDF), Tafel, Übungsblätter. Stud.IP: Dokumente, Beispieldateien für Simulationen, Simulationssoftware

Literatur:	M. Polke: Prozessleittechnik J. Bergmann: Automatisierungs- und Prozessleittechnik Klefenz, G.: Die Regelung von Dampfkraftwerken Smith, C. A.: Automated Continuous Process Control Verschiedene Fachpublikationen des VGB, VDE und IEEE Unterlagen der entso-e, Grid Codes und Policies 2007

Modul 15: Dynamische Simulation des energetischen Verhaltens von Gebäuden

Studiengang:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbezeichnung:	Dynamische Simulation des energetischen Verhaltens von Gebäuden
ggf. Kürzel	
ggf. Untertitel	
ggf. Lehrveranstaltungen:	
Semester:	2.
Modulverantwortliche(r):	Prof. Dr.-Ing. Jürgen Teifke
Dozent(in):	Prof. Dr.-Ing. Jürgen Teifke
Sprache:	Deutsch/englisch
Zuordnung zum Curriculum	M. Sc. Energie- und Umweltmanagement Pflichtmodul 2. Semester
Lehrform / SWS:	Vorlesung 2 SWS Übung 2 SWS
Arbeitsaufwand:	Präsenzstudium: 45 h Eigenstudium: 105 h
Kreditpunkte:	5
Voraussetzungen:	Baut auf den Modulen „Thermodynamik" und „Wärme- und Stoffübertragung" des Bachelorangebotes auf
Lernziele / Kompetenzen:	Die Studenten beherrschen die Gesetze des für das Berufsbild wichtigen energetischen Verhaltens von Gebäuden und kennen Grundlagen und Bedeutung einer dynamischen (zeitabhängigen) Betrachtung. Sie können ein wichtiges international anerkanntes Tool (Programm-paket TRNSYS 16) als Methode anwenden und die Ergebnisse der Anwendung interpretieren und bewerten. Lernziele: Fachspezifisches Vertiefungswissen, technische und methodische Kompetenz.
Inhalt:	1 Grundlagen 1.1 Das thermisches Verhalten von Baukörpern 1.2 Einflussgrößen für das thermische Verhalten 1.3 Arten der Wärmeübertragung 1.4 Interne Effekte 1.4.1 Wärmequellen 1.4.2 Wärmespeicherung 1.5 Beispiele für dynamisches Verhalten 2 Stationäre und dynamische Betrachtung 2.1 Stationäre Wärmeübertragung 2.2 Methoden dynamischer Betrachtung 2.2.1.1 Lösung von Differentialgleichungen 2.2.1.2 Analytische Methoden 2.2.2.3 Numerisches Methoden 2.2.2.4 Konvergenz und Integration 3 Programm TRNSYS 16 3.1 Allgemeines 3.2 Konzept/Modularer Aufbau 3.3 Programmkomponenten und deren Aufgabe 3.4 Types (vordefinierte Funktionen) 3.5 Anwendungen

	3.6 Übungsbeispiel 3.7 Aufbau eines Simulationsmodells für ein Gebäude (Multi-Zone Building) 3.8 Erweiterung des Modells
Studien- Prüfungsleistungen:	Klausur 120 Minuten (am Rechner)
Medienformen:	Tafel Folien (Powerpiont, PDF) Rechnerarbeitsplatz
Literatur:	Carnahan, B., Luther, H.A. und J.O. Wildes: Applied Numerical Methods, Wiley, New York 1969 Chapra, S.C. und R.P. Canale: Numerical Methods for Engineers with Personal Computer Application, McGraw-Hill, New York 1985 Hiller, M., Holst, S., Knirsch, A. und M. Schuler: TRNSYS 15 Update Description, Transsolar, Stuttgart 2000

Modul 16: Foundations of Sustainable Energy Systems

Studiengang/course:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbezeichnung / module name:	Foundations of Sustainable Energy Systems
ggf. Kürzel / abbreviation	FSES
ggf. Untertitel / subtitle	
ggf. Lehrveranstaltungen / seminar:	Foundations of Sustainable Energy Systems
Semester / semester:	2nd semester
Modulverantwortliche(r) / person in charge of module:	Prof. Dr. Olav Hohmeyer
Dozent(in) / person teaching the seminar:	Prof. Dr. Olav Hohmeyer
Sprache / language:	Englisch
Zuordnung zum Curriculum / attribution to courses:	M. Eng. Energie- und Umweltmanagement / M.Eng. Energy and Environmental Management Compulsory Course for the first semester M.Eng.
Lehrform / SWS / form of seminar / teaching hours per week:	Seminar
Arbeitsaufwand / student workload:	45 hours of teaching and 105 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 to differentiate the competing definitions of sustainable development. They will learn to identify the major requirements and obstacles for sustainable development of the energy system. At the end of the course they will be able ot analyse every present and future energy system fot its properties relevant to sustainable development. Competencies covered: • problem solving • analytical thinking • life long learning • interdisciplinary knowledge • economic competence • technical competence • ecologic competence • methodological competence • social and ethical responsibilty • self organisation and teamwork • project organising skills • conflict solving skills • interdisciplinary communication
Inhalt / subjects covered:	The following topics will be covered in the module: • What are the different concepts of sustainability? • How does sustainable development relate to the

	properties of energy systems? • What are major problems of present energy systems towards sustainalbe development? • Detailed analysis of the German energy system and its non sustainable aspects • Detailed analysis of the energy systems of a developing country (like India) and its non sustainable aspects • Analysis of the driving factors for the development of energy systems • Analysis of probable future development of the German energy system under a business as usual scenario • Analysis of the probable future development of the energy system of a selected developing country under a business as usual scenario • Identification of the most important necessary changes and interventions to steer towards mor sustainable energy systems
Studien-Prüfungsleistungen / form of examination:	Continuous presentation of the results of the different teams in the seminar and a final written report by each team
Medienformen / media used:	Group work and lectures with beamer based presentations
Literatur / basic literature for the module:	Costanza, Robert (ed.) (1991): Ecological Economics: The Science and Management of Sustainability. New York, Columbia University Press Chichilnisky, Graciella (1999): What is Sustainable Development? In: Hohmeyer, Olav und Klaus Rennings (eds.): Man-made Climate Change. Economic Aspects and Policy Options. Heidelberg, Physica-Verlag. S. 42-82 Deutscher Bundestag - Enquete Kommission „Nachhaltige Energieversorgung" (2002): Abschlussbericht. http://www.bundestag.de/parlament/kommissionen/archiv/ener/schlussbericht/index.htm OECD (2004): World Energy Outlook 2004. Paris WEC (World Energy Council) (2003): Drivers of the Energy Scene. London Plus specialised literature and statistics on the countries analysed.

Modul 17: Environmental Economics

Studiengang/course:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbezeichnung / module name:	Environmental Economics
ggf. Kürzel / abbreviation	
ggf. Untertitel / subtitle	
ggf. Lehrveranstaltungen / seminar:	Environmental Economics I, Environmental Economics II
Semester / semester:	1st semester
Modulverantwortliche(r) / person in charge of module:	Dipl.-Volksw. Julia Schirrmacher
Dozent(in) / person teaching the seminar:	Dipl.-Volksw. Julia Schirrmacher
Sprache / language:	English
Zuordnung zum Curriculum / attribution to courses:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management Compulsory Course for the first semester M. Eng. Energy and Environmental Management
Lehrform / SWS / form of seminar / teaching hours per week:	Lecture / 4
Arbeitsaufwand / student workload:	60 hours of teaching 90 hours of student work
Kreditpunkte / credit points:	5
Voraussetzungen / preconditions:	Admission to the M. Eng. Energy and Environmental Management Basic knowledge in Economics (especially Microeconomics)
Lernziele / Kompetenzen / aims of the module / competencies:	The course covers a broad range of interactions between the environment and economics and issues of sustainable development. Students will learn different methodologies to analyse ecological and economic influences on the environment, different approaches on valuing the environment and the resulting problems . Students will become acquainted with different economic instruments to deal with external effects on the environment and its resources and they will be able to examine the effectiveness and efficiency of these instruments. Competencies covered: • ability to solve problems • target-oriented action • specific knowledge in environmental economics • interdisciplinary in-depth knowledge • subject-specific in-depth knowledge • economic competence • ecological competence • methodological competence • social and ethical responsibility • self organisation and teamwork • project organising skills • conflict solving skills • interdisciplinary communication

	• analytical thinking
Inhalt / subjects covered:	The following topics will be covered in the module: • Origins of the Sustainability Problem • Concepts of Sustainability • Ethics and the Environment - naturalist vs. humanist moral philosophies - Utilitarianism - Rawls Theory of Justice • Welfare Economics of the Environment - Efficiency, Optimality and Equity - Allocation in Market Economies - Market Failure and the Environment • Environmental Pollution: External Effects - Targets and Instruments - Public Goods and Common Resources • Valuing the Environment - Concepts - Methods • Natural Resource Economics - Efficient and Optimal Use of Natural Resources - Non-Renewable Extraction - Renewable Resources Extraction - Stock Pollution Problems • International Dimension of Environmental Problems
Studien- Prüfungsleistungen / form of examination:	Oral presentation of the results of the different teams in the seminar and a final written report by each team
Medienformen / media used:	Group work and lectures with beamer based presentations
Literatur / basic literature for the module:	• Hussen, A. M. (2000): Principles of Environmental Economics – Economics, Ecology and Public Policy, London. • Kolstad, C. D. (2000): Environmental Economics, New York. • Parkin, M.; Powell, M.; Matthews, K. (2005): Economics, (insbes. Part 4: Government in the Economy), Essex. • Perman, R.; Yue Ma; McGilvray, J. and Common, M. (2003), Natural Resource and Environmental Economics, 3rd. Edition, Essex, UK. • Siebert, H. (1998): Economics of the Environment, 5th Ed., Berlin. • Tietenberg, T. (2009): Environmental and Resource Economics, 8th Edition, Boston.

Modul 18: Environmental Management

Studiengang/course:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbezeichnung / module name:	Environmental Management
ggf. Kürzel / abbreviation	
ggf. Untertitel / subtitle	
ggf. Lehrveranstaltungen / seminar:	
Semester / semester:	1st semester
Modulverantwortliche(r) / person in charge of module:	Prof. Hohmeyer
Dozent(in) / person teaching the seminar:	Dirk Storm
Sprache / language:	English
Zuordnung zum Curriculum / attribution to courses:	Compulsory course for the first semester M. Eng.
Lehrform / SWS / form of seminar / teaching hours per week:	Lecture, 4 SWS
Arbeitsaufwand / student workload:	Teaching: 60 hours Preparation, homework, exam preparation: 90 hours
Kreditpunkte / credit points:	5 ECTS
Voraussetzungen / preconditions:	none
Lernziele / Kompetenzen / aims of the module / competencies:	Students are to get practical insight into the duties and opportunities of environmental protection officers. A wide range of professional knowledge is taught as well as the ability to balance environmental protection demands with classic business objectives, integrating the points of view of a variety of intern and extern stakeholders. Learning outcomes: ability to solve problems, target-oriented action, interdisciplinary in-depth knowledge, subject-specific in-depth knowledge, economical competence, technical competence, ecological competence, methodological competence, project-management, strategic competence, entrepreneurial thinking.
Inhalt / subjects covered:	- Environmental Management - Strategic Environmental Management - Organisation of Business-Related Environmental Protection - Environment-Orientated Human Resource Management - Eco-Controlling - Business-Related Environmental Key Figures

	- EMAS – ISO 14001 /Greenwash - Integrated Management Systems
Studien- Prüfungsleistungen / form of examination:	Written exam
Medienformen / media used:	Power Point
Literatur / basic literature for the module:	- Practical reading - Baumast, Annett und Jens Pape (Hrsg.) (2003): Betriebliches Umweltmanagement. Theoretische Grundlagen, Praxisbeispiele. 2. aktualisierte Auflage. Ulmer Stuttgart. - Schaltegger, Stefan, Roger Burritt und Holger Petersen (2003): An introduction to corporate environmental management: striving for sustainability. Greenleaf Sheffield. - Welford, Richard (2004): Corporate environmental management. Part 1: Systems and Strategies. 2. edition. Earthscan London. - Welford, Richard (1997): Corporate environmental management. Part 2: Culture and Organization. Earthscan London. - Welford, Richard (2000): Corporate environmental management. Part 3: Towards sustainable development. Earthscan London.

Modul 19: Trading Energy

Studiengang/course:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbezeichnung / module name:	Trading Energy
ggf. Kürzel / abbreviation	TE
ggf. Untertitel / subtitle	
ggf. Lehrveranstaltungen / seminar:	Trading Energy
Semester / semester:	2nd semester
Modulverantwortliche(r) / person in charge of module:	Prof. Dr. Olav Hohmeyer
Dozent(in) / person teaching the seminar:	Prof. Dr. Olav Hohmeyer, Dipl.-Wi.-Ing. Jörn Higgen, Dipl.-Wi.-Ing. Marcel Ketterer
Sprache / language:	Englisch
Zuordnung zum Curriculum / attribution to courses:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management Core Elective Course for the second semester M. Eng.
Lehrform / SWS / form of seminar / teaching hours per week:	Seminar / 3 SWS
Arbeitsaufwand / student workload:	45 hours of teaching and 105 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 be familiar with the different energy markets, the different financial instruments like futures and options as used in energy markets. Students will learn to use fundamental and technical analysis as far as they are relevant to energy markets. Students will learn about the specific aspects of trading electric power in liberalized energy markets. Students will understand the role of futures and options markets to hedge against risks. Students will be able to develop their own fundamental analysis of the electricity market in Europe. Competencies covered: • analytical thinking • life long learning • specific knowledge in energy markets • specific knowledge in finacial instruments • specific knowledge in fundamental and technical analysis of energy markets • economic competence • methodological competence • self organisation and teamwork • project organising skills • conflict solving skills
Inhalt / subjects covered:	The following topics will be covered in the module: • The different energy markets

	○ The oil market ○ The gas market ○ The coal market ○ The electricity market • OTC markets • Spot markets • Futures • Options • Fundamental Analysis • Technical Analysis • Risk management and hedging • Using fundamental analysis on the electricity market in Europe • Strategies for electricity and gas producers in liberalized markets • Strategies for electricity consumers and gas in liberalized markets
Studien- Prüfungsleistungen / form of examination:	Oral presentation of the results of the different teams in the seminar and a final written report by each team
Medienformen / media used:	Group work and lectures with beamer based presentations
Literatur / basic literature for the module:	Kleinman, George (1997): Mastering Commodity Futures and Options – The Secrets of Successful Trading. Financial Times Management, London Schwager, Jack D. (1995): Schwager on Futures – Technical Analysis. John Wiley and Sons, New York, N.Y. Schwager, Jack D. (1995): Schwager on Futures – Fundamental Analysis. John Wiley and Sons, New York, N.Y. Schwager, Jack D. (1996): Futures, Study Guide: Fundamental Analysis. John Wiley and Sons, New York, N.Y. Schwager, Jack D. (1997): Schwager on Futures – Study Guide to Accompany Technical Analysis. John Wiley and Sons, New York, N.Y.

Modul 20: External Costs of Energy and Climate Change

Studiengang/course:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbezeichnung / module name:	External Costs of Energy and Climate Change
ggf. Kürzel / abbreviation	ECE
ggf. Untertitel / subtitle	
ggf. Lehrveranstaltungen / seminar:	• Analysis of external costs of energy – methodology and major studies • Impacts and external costs of climate change
Semester / semester:	2nd semester
Modulverantwortliche(r) / person in charge of module:	Prof. Dr. Olav Hohmeyer
Dozent(in) / person teaching the seminar:	Prof. Dr. Olav Hohmeyer
Sprache / language:	Englisch
Zuordnung zum Curriculum / attribution to courses:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management Core Elective Course for the second semester M. Eng.
Lehrform / SWS / form of seminar / teaching hours per week:	Seminar
Arbeitsaufwand / student workload:	45 hours of teaching and 105 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 different methodologies to analyse external costs. Students will be able to analyse major international studies of external costs of energy (ExternE and USDOE/RFF/Oak Ridge National Lab) and understand the specific differences of the competing approaches. Students will understand the major impacts of climate change and the possibilities and difficulties of deriving the external costs of these impacts. Competencies covered: • analytical thinking • life long learning • specific knowledge in external cost analysis • interdisciplinary knowledge • economic competence • ecologic competence • methodological competence • social and ethical responsibilty • self organisation and teamwork • project organising skills • conflict solving skills • interdisciplinary communication
Inhalt / subjects covered:	The following topics will be covered in the module: • The basic concept of external and social costs

	• Internalisation of external costs versus policies securing strong sustainability
	• Damage costs versus control cost approach
	• Marginal versus average costs
	• Impact pathway approach and marginal costing
	• Valuation approaches
	  ○ Market prices and cost measures of value
	  ○ Travel cost method
	  ○ Hedonic pricing
	  ○ Contingent valuation method
	  ○ Discrete choice methods
	• Major external international studies of external costs of energy
	  ○ ExternE
	  ○ DOE/RFF/Oak Ridge
	  ○ New York State I and II
	  ○ Hohmeyer 1988
	• Impacts of man-made climate change
	  ○ The IPCC Third Assessment Report
	  ○ Mitigation, adaptation and impacts
	  ○ Impacts on hydrology and water resources
	  ○ Impacts on ecosystems
	  ○ Impacts on human settlements, energy and industry
	  ○ Impacts on insurance and finance
	  ○ Impacts on human health
	  ○ Impacts on the different regions of the world
	• Possibilities and problems of monetization of external costs of climate change
	• Internalization of external costs in the context of sustainable development

Studien- Prüfungsleistungen / form of examination:	Oral presentation of the results of the different teams in the seminar and a final written report by each team
Medienformen / media used:	Group work and lectures with beamer based presentations
Literatur / basic literature for the module:	Cline, William R. (1992): The Economics of Global Warming. Institute for International Economics, Washington D.C. European Commission (1995): ExternE – Externalities of Energy. Volume 1 – 9. Office for Official Publications of the European Commission, Luxemburg Garrod, Guy and Kenneth G. Willis (1999): Economic Valuation of the Environment – Methods and Case Studies. Edward Elgar, Cheltenham Hohmeyer, Olav (1988): Social Costs of Energy. Springer, Berlin Ottinger, Richard et al. (1990) : Environmental Costs of Electricity. Oceana Publications, Dobbs Ferry N.Y.

	Oak Ridge National Laboratory and Resources for the Future (1994): External Costs and Benefits of Fuel Cycles – A Study by the U.S. Department of Energy and the Commission of the European Communities. Utility Data Institute, no place

Modul 21: Shaping Sustainable Energy Systems

Studiengang/course:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbezeichnung / module name:	Shaping Sustainable Energy Systems
ggf. Kürzel / abbreviation	SSES
ggf. Untertitel / subtitle	
ggf. Lehrveranstaltungen / seminar:	Shaping Sustainable Energy Systems
Semester / semester:	2nd semester
Modulverantwortliche(r) / person in charge of module:	Prof. Dr. Olav Hohmeyer
Dozent(in) / person teaching the seminar:	Prof. Dr. Olav Hohmeyer
Sprache / language:	English
Zuordnung zum Curriculum / attribution to courses:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management Core Elective Course for the second semester M. Eng.
Lehrform / SWS / form of seminar / teaching hours per week:	Seminar
Arbeitsaufwand / student workload:	45 hours of teaching and 105 hours of student work
Kreditpunkte / credit points:	5
Voraussetzungen / preconditions:	Foundations of Sustainable Energy Systems
Lernziele / Kompetenzen / aims of the module / competencies:	Students will learn to design consistent scenarios of sustainable energy systems avoiding major interference with the global climate system and avoiding large and long term risks and irreversible damages. Students will be able to identify necessary energy policy measures to secure such sustainable energy development and to compare the internal and external costs of different energy systems. Competencies covered: • problem solving • ability to act strategically • analytical thinking • life-long learning • interdisciplinary knowledge • economic competence • technical competence • ecologic competence • political competence • methodological competence • social and ethical responsibility • self organisation and teamwork • project organising skills • conflict solving skills • interdisciplinary communication
Inhalt / subjects covered:	The following topics will be covered in the module:

	• How does sustainable development relate to properties of the energy system? • Basic scenario techniques • Analysis of driving factors of the development of energy systems • Analysis of existing status quo scenarios for Germany • Analysis of existing sustainable energy scenarios for Germany • Building a consistent sustainable energy sceanario for Germany • Building a consistent sustainable energy scenario for a selected develping country (like India) • Analysis of the internal and external costs of the different scenarios • Analysis of the necessary energy policies and instruments to secure a sustainable energy system
Studien- Prüfungsleistungen / form of examination:	Continuous presentation of the results of the different teams in the seminar and a final written report by each team
Medienformen / media used:	Group work and lectures with beamer based presentations
Literatur / basic literature for the module:	• Robert Costanza, John Cumberland, Herman Daly, Robert Goodland, and Richard Norgaard: Introduction to Ecological Economics, , forthcoming. • Enquete-Kommission Nachhaltige Energieversorgung unter den Bedingungen der Globalisierung und der Liberalisierung: Endbericht. 2002 (PDF verfügbar) • OECD: World Energy Outlook 2004. Paris 2004 • World Energy Council : Drivers of the Energy Scene. London, 2003 Plus specialised literature and statistics on the countries analysed.

Modul 22: Energy and Environmental Policy

Studiengang / course:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbezeichnung / module name:	Energy and environmental policy
ggf. Kürzel / abbreviation	
ggf. Untertitel / subtitle	
ggf. Lehrveranstaltungen / seminar:	
Semester / semester:	1st or 2nd semester
Modulverantwortliche(r) / person in charge of module:	Emöke Kovac
Dozent(in) / person teaching the seminar:	Emöke Kovac
Sprache / language:	English
Zuordnung zum Curriculum / attribution to courses:	Core elective module for EEM
Lehrform / SWS / form of seminar / teaching hours per week:	4 SWS Seminar, Discussion, Role Play
Arbeitsaufwand / student workload:	Attendance: 60 h Private study: 90 h
Kreditpunkte / credit points:	5 ECTS
Voraussetzungen nach Prüfungsordnung/ preconditions according to examination regulations:	Admission to M. Eng. EEM
Empfohlene Voraussetzungen / recommended preconditions	
Modulziele / angestrebte Lernergebnisse / aims of the module / aspired learning outcome:	• Basic knowledge of political analysis • Understanding limits and chances of energy and environmental policy, esp. in the context of globalization. • Understanding the dimensions of ethics and power within political processes • Understanding the implementation of policy tools in practice as compared to theory • Knowledge of important stakeholders in energy and environmental policy • Basic knowledge of lobbying and legislation processes in the EU • Developing and representing their own position in the political context (role play), analysing the positions of fellow stakeholders, analysing strategic planning to reach political goals Competencies covered: • specific knowledge in political analysis • interdisciplinary knowledge • social and ethical responsibility • self organisation and teamwork

	• project organising skills • conflict solving skills

Inhalt / subjects covered:	• Polity, policy, politics
	• Concepts, questions and application of political analysis
	• Introduction to policy instruments
	  ○ Criteria for the selection of instruments
	  ○ Criteria for the evaluation of instruments
	  ○ Types of instruments and examples
	• Historical overview on German and EU environmental and energy policies
	• Energy and the Millennium Development Goals: energy and environmental issues in developing and developed countries
	• Legislation in the EU
	• Discussion and analysis of current issues

Studien- Prüfungsleistungen / form of examination:	• Participation in the Role Play and written paper preparing and analysing the Role Play • Group presentation, moderation of a discussion and semester paper on a current issue • Participation in discussions
Medienformen / media used:	Flipcharts, Brainstorming cards, Power point, current news, LEGO planning game (introduction)
Literatur / literature:	Wallace et al. 2005: Policy-Making in the European Union Jänicke 2003: Lern- und Arbeitsbuch Umweltpolitik : Politik, Recht und Management des Umweltschutzes in Staat und Unternehmen Current issues of journals, e.g. Energy Policy

Modul 23: Moderation beteiligungsorientierter Prozesse

Studiengang:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbezeichnung:	Moderation beteiligungsorientierter Prozesse
ggf. Kürzel	
ggf. Untertitel	Entwicklung und Moderation beteiligungsorientierter Prozesse zur Erarbeitung und Umsetzung von Energie-, Umwelt- und Klimaschutzkonzepten in Unternehmen, Körperschaften und Kommunen
ggf. Lehrveranstaltungen:	
Semester:	2. Semester (Wintersemester)
Modulverantwortliche(r):	Prof. Dr. Olav Hohmeyer
Dozent(in):	Prof. Dr. Marianne Resch
Sprache:	Deutsch
Zuordnung zum Curriculum	M. Eng. Energie- und Umweltmanagement Wahlpflichtkurs für den Schwerpunkt ‚Industrieländer'
Lehrform / SWS:	Seminar mit Kleingruppenarbeit und Rollenspiel
Arbeitsaufwand:	45 Stunden Arbeit im Seminar, 105 Stunden Vor- und Nachbereitung der Veranstaltung durch die Studierenden
Kreditpunkte:	5
Voraussetzungen:	Keine speziellen Voraussetzungen
Lernziele / Kompetenzen:	Studierende sollen Fähigkeiten und Fertigkeiten erwerben, um kleine Gruppen anzuleiten und dabei zu begleiten, in einem beteiligungsorientierten diskursiven Prozess Energie-, Umwelt- und Klimakonzepte zu entwickeln und umzusetzen. Hierzu gehören sowohl die Entwicklung der notwendigen Konzeption der Prozesse als auch ihre Umsetzung und Evaluierung. Hierbei werden folgende Lernziele des Lernzielkatalogs einbezogen: - Fähigkeit zu erfolgreichem und zielgerichtetem Handeln - Fähigkeit zur Selbstorganisation - Fähigkeit zur Projektorganisation - Fähigkeit zum konstruktiven Umgang mit Kritik - Fähigkeit zur Lösung von Konflikten - Strategische Handlungskompetenz - Fähigkeit zur interdisziplinären Kommunikation - Fähigkeit, analytisch zu denken - Teamfähigkeit - Fähigkeit, Gruppenprozesse zielorientiert zu gestalten und zu moderieren
Inhalt:	- Diskussionstechniken - Grundlagen der Leitung von Diskussionen - Grundlagen der Moderation von Prozessen, wie z. B. - sozialpsychologische Theorien der Einstellungsbildung und der Verhaltensmodifikation - Informationsverarbeitung und Bewertung - Umgang mit Moderationsmaterialien

	- Überblick über zentrale Techniken der Steuerung von Diskussionsprozessen, wie z. B. - Brainstorming, - Zuruflisten, - Punktebewertung, - Kartenabfragen, - Fokussieren von Diskussionen, - Zusammenfassen von Diskussionen, - Strukturieren von Ergebnissen, - Konsensbildung - eigenständige Entwicklung eines Konzepts zur Durchführung eines Workshops - Rollenspiele zur Durchführung von Workshops mit zeitnahem Feedback zur Unterstützung des Aufbaus sozialer Fertigkeiten
Studien- Prüfungsleistungen:	Vorbereitung und Durchführung eines Workshops als Rollenspiel
Medienformen:	Präsentation mit Hilfe von Overheads und Videos, alle notwendigen Medien für die professionelle Durchführung von Workshops
Literatur:	Gehm, Theo: Kommunikation im Beruf. 2. überarbeitete Auflage, Weinheim, 2006 Semmer, Norbert und Margrete Pfäfflin: Interaktionstraining. Ein handlungstheoretischer Ansatz zum Training sozialer Fertigkeiten. Weinheim, 1978 Hartmann, Martin, Rüdiger Funk und Christian Arnold: Gekonnt moderieren. Weinheim, 2000

Modul 24: Project Management

Studiengang / course:	BSc in European Studies
Modulbezeichnung / module name:	Project Management
ggf. Kürzel / abbreviation	
ggf. Untertitel / subtitle	
ggf. Lehrveranstaltungen / seminar:	
Semester / semester:	1. (Die Veranstaltung wird in Sonderburg gelehrt. Das dänische Semester beginnt im Februar!)
Modulverantwortliche(r) / person in charge of module:	Prof. Olav Hohmeyer
Dozent(in) / person teaching the seminar:	Anke Sadowski (MSc)
Sprache / language:	English
Zuordnung zum Curriculum / attribution to courses:	M. Eng. Energie- und Umweltmanagement, Wahlpflicht, Wintersemester
Lehrform / SWS / form of seminar / teaching hours per week:	4 SWS Workshops, virtual group work, feedback meetings
Arbeitsaufwand / student workload:	**Workload / virtual phase:** 9 weeks – min. 6-8 hours of preparation for the weekly written paper (including cooperation with group members) Total = 53-72 hours **Workload / Workshops + Feedback meeting:** The student's workload adds up from 40 hours of lessons given in 2 different workshops and in the feedback meetings. **Workload preparation for Exams:** - ca. 20 hours preparation for the written exam 113-153 hours workload
Kreditpunkte / credit points:	7,5 ECTS (for EUM/EEM students only **5 CP** counting)
Voraussetzungen nach Prüfungsordnung/ preconditions according to examination regulations:	None
Modulziele / angestrebte Lernergebnisse / aims of the module / aspired learning outcome:	Students learn about the theoretical background of project management instruments, methods used by project managers in companies, also e.g. in European institutions. Aim of the course is to obtain special project management knowledge. The course has to establish the understanding for project working methods and instruments. But also typical soft skills have to be trained through the special combination of Blended Learning. Learning outcomes: conflict-management, self-management, project-management, strategic competence, interdisciplinary in-depth knowledge, ability to solve problems,

<table>
<tr><td></td><td>interdisciplinary thinking, entrepreneurial thinking, team skills, leadership, methodological competence</td></tr>
<tr><td>Inhalt / subjects covered:</td><td>
<table>
<tr><th>Topics</th><th>Contents</th></tr>
<tr><td>Project management</td><td>Concept of a “project”, project management tasks, mechanism of coordination and degree of organization</td></tr>
<tr><td>Project Environment and Stakeholder</td><td>Projects and their environment, Analysis of the Project Environment: Stakeholder Analysis, project marketing (project promotion, media und public relational work), Controlling the Project Environment</td></tr>
<tr><td>Project Management Implementation</td><td>Implementation Process, Project Management Manual and Project Handbook</td></tr>
<tr><td>Project Targets</td><td>Project Targets, Target Characteristics, Development of Target Hierarchies</td></tr>
<tr><td>Project Success and Failure Criteria</td><td>Project Success and Attainment of Project Targets, General Criteria of Project Success with Regard to the Project Targets, Success Criteria of the Stakeholders</td></tr>
<tr><td>Project Phases and Life Cycle</td><td>The Phase Model, Phase Model and Milestone Planning, Importance of the Phase Model in Project Planning.</td></tr>
<tr><td>Social Competence</td><td>Communication, Motivation, Social Structures, Groups and Teams, Self-Management, Leadership, Conflict Management, Special Communication Situations, Intercultural Teams, Intercultural Communication (Chairing Meetings, Chairing and Structuring a Project Group Meeting, Chairing a Workshop, Holding Negotiations, Project Presentation)</td></tr>
<tr><td>Methods Competence</td><td>Work Breakdown, Activity Sequencing and Schedule Management, Resource Management Cost Management, Financial Resource Management, Performance Assessment and Project Progress, Integrated Project Control</td></tr>
<tr><td>Organizational Competence</td><td>Company and Project Organization Documentation Management, Configuration and Change Management, Project Startup, Information and Reporting, Risk Management, Project Closeout and Evaluation, Human Resource Management and Project Management</td></tr>
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</td></tr>
<tr><td>Studien- Prüfungsleistungen / form of examination:</td><td>Continuous examination: weekly group papers
Written exam</td></tr>
</table>

Medienformen / media used:	Power point, webbased platform (SDU blackboard), skype
Literatur / literature:	ICB IPMA Competence Baseline (english version) – can be free downloaded over e.g.: http://www.gpm-ipma.de, but will be also delivered by the lecturer Schelle H., Ottmann R., Pfeiffer A., Wolff B.; „Project Manager" (2006), German Association for Project Management, Member of the International Project Management Association

Modul 25: Project Development

Studiengang / course:	BSc in European Studies
Modulbezeichnung / module name:	Project Development
ggf. Kürzel / abbreviation	
ggf. Untertitel / subtitle	
ggf. Lehrveranstaltungen / seminar:	
Semester / semester:	1. oder 2.
Modulverantwortliche(r) / person in charge of module:	Prof. Olav Hohmeyer
Dozent(in) / person teaching the seminar:	Anke Sadowski (MSc)
Sprache / language:	English
Zuordnung zum Curriculum / attribution to courses:	M. Eng. Energie- und Umweltmanagement, Wahlpflicht, Sommersemester oder Wintersemester
Lehrform / SWS / form of seminar / teaching hours per week:	3 SWS Workshops, virtual group work, feedback meetings
Arbeitsaufwand / student workload:	**Workload / Workshops:** The student's workload adds up from 10 hours of lessons given in 2 different workshops. **Workload preparation for Exams:** - 20-35 hours preparation the close out oral exam/ project presentation **Workload / real phase:** 6 weeks – 8-10 hours of preparation per week (including cooperation with group members) = 56 – 60 hours 86-105 hours workload
Kreditpunkte / credit points:	7,5 ECTS (for EUM/EEM students only **5 CP** counting)
Voraussetzungen nach Prüfungsordnung/ preconditions according to examination regulations:	Project management
Modulziele / angestrebte Lernergebnisse / aims of the module / aspired learning outcome:	Students adopt already learned theoretical backgrounds of project management instruments and methods (course "project management") in a project development context. The student has to initiate and realise an own "real" project. The student has to define a project appraise together with an external project initiator. The student has to realise this assignment. Therefore the student has to apply all known relevant project management control mechanisms and instruments in the right way. The student has to handle by himself problems in a "real project situation": e.g. time pressure, task assignments,

<table>
<tr><td></td><td>communication problems.
Learning outcomes: conflict-management, self-management, project-management, strategic competence, interdisciplinary in-depth knowledge, ability to solve problems, interdisciplinary thinking, entrepreneurial thinking, team skills, leadership, methodological competence</td></tr>
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<tr><td>Methods Competence</td><td>Work Breakdown, Activity Sequencing and Schedule Management, Resource Management Cost Management, Financial Resource Management, Performance Assessment and Project Progress, Integrated Project Control</td></tr>
<tr><td>Organizational Competence</td><td>Company and Project Organization Documentation Management, Configuration and Change Management, Project Startup,</td></tr>
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		Information and Reporting, Risk Management, Project Closeout and Evaluation, Human Resource Management and Project Management
Studien- Prüfungsleistungen / form of examination:	Continuous examination: basis plan, status report, final project paper Oral exam/ team project presentation	
Medienformen / media used:	Power point, webbased platform (SDU blackboard), skype	
Literatur / literature:	ICB IPMA Competence Baseline (english version) – can be free downloaded over e.g.: http://www.gpm-ipma.de, but will be also delivered by the lecturer Schelle H., Ottmann R., Pfeiffer A., Wolff B.; „Project Manager" (2006), German Association for Project Management, Member of the International Project Management Association	

Modul 26: Integrierte Klimaschutzkonzepte

Studiengang/course:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbezeichnung / module name:	Integrierte Klimaschutzkonzepte
ggf. Kürzel / abbreviation	IKK
ggf. Untertitel / subtitle	
ggf. Lehrveranstaltungen / seminar:	1. Fördermöglichkeiten / Antragstellung und theoretische Grundlagen 2. Klimaschutzkonzepte in der Praxis 3. Partizipative Konzepterstellung
Semester / semester:	Im Sommer- oder Wintersemester
Modulverantwortliche(r) / person in charge of module:	Dipl.-Wi.-Ing. Helge Maas Dipl.-Wi.-Ing. Martin Beer
Dozent(in) / person teaching the seminar:	Dipl.-Wi.-Ing. Helge Maas Dipl.-Wi.-Ing. Martin Beer
Sprache / language:	Deutsch
Zuordnung zum Curriculum / attribution to courses:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management Wahlkurs
Lehrform / SWS / form of seminar / teaching hours per week:	Seminar
Arbeitsaufwand / student workload:	45 h Lehre, 105 h Eigenarbeit
Kreditpunkte / credit points:	5
Voraussetzungen / preconditions:	Zulassung zum Studiengang M. Eng. Energy and Environmental Management
Lernziele / Kompetenzen / aims of the module / competencies:	Lerninhalte (stichpunktartig): • Antragsstellung Klimaschutzprojekte • Theoretische Grundlagen Backcasting, Transition Management • lokaler / akteursbezogener Klimaschutz • Datenerhebung, Datenerfassung, Datenauswertung • Szenarienentwicklung, Forecasting • Integrative Ansätze • Partizipative Ansätze • Visionserstellung Energie und Klimaschutz • Multiplikatortheorie • Anwendung in der Praxis • Potentialanalyse Geförderte Kompetenzen: • Problemlösungsfähigkeit • Fähigkeit zu erfolgreichem und zielgerichtetem Handeln • Befähigung zu lebenslangem selbständigem Lernen • Fachübergreifendes Vertiefungswissen • Ökonomische Kompetenz • Technische Kompetenz • Ökologische Kompetenz

	• Methodische Kompetenz • Gesellschaftliches und ethisches Verantwortungsbewusstsein • Fähigkeit zur Selbstorganisation • Fähigkeit zur Projektorganisation • Fähigkeit zu fächerübergreifendem Denken • Strategische Handlungskompetenz • Fähigkeit zur interdisziplinären Kommunikation • Fähigkeit analytisch zu denken • Teamfähigkeit
Inhalt / subjects covered:	• Antragsstellung Klimaschutzprojekte • Theoretische Grundlagen Backcasting, Transition Management • lokaler / akteursbezogener Klimaschutz • Datenerhebung, Datenerfassung, Datenauswertung • Szenarienentwicklung, Forecasting • Integrative Ansätze • Partizipative Ansätze • Visionserstellung Energie und Klimaschutz • Multiplikatortheorie • Anwendung in der Praxis • Potentialanalyse
Studien- Prüfungsleistungen / form of examination:	Seminararbeit / Kurzpräsentation / Projektbericht
Medienformen / media used:	Powerpoint-basierter Vortrag
Literatur / basic literature for the module:	• Fischer, Kallen (1997), Klimaschutz in Kommunen - Leitfaden zur Erarbeitung und Umsetzung kommunaler Klimakonzepte, Hrsg.: Deutsches Institut für Urbanistik • Pehnt (Hrsg.) (2010), Energieeffizienz - Ein Lehr- und Handbuch, Springer Verlag • Recknagel, Schramek, Sprenger (2010), Taschenbuch für Heizung und Klimatechnik, Oldenbourg Industrieverlag • Quist (2007), Backcasting for a Sustainable Future, The impact after ten years, Eburon Academic Publishers • Rogers (2003), Diffusion of Innovations, Fifth Edition, Free Press • Hohmeyer, Kovač, Maas, Beer (2011), Integriertes Klimaschutzkonzept für Flensburg

Modul 27: Investment Analysis and Financing of Energy Projects

Studiengang / course:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbezeichnung / module name:	Investment Analysis and Financing of Energy Projects
ggf. Kürzel / abbreviation	
ggf. Untertitel / subtitle	
ggf. Lehrveranstaltungen / seminar:	
Semester / semester:	1st or 2nd semester (summer or winter term)
Modulverantwortliche(r) / person in charge of module:	Prof. Dr. Olav Hohmeyer
Dozent(in) / person teaching the seminar:	Dipl.-Wi.-Ing. Lena Kitzing, M.Sc. Eng. David Mora
Sprache / language:	English
Zuordnung zum Curriculum / attribution to courses:	M. Eng. Energy and Environmental Management 1st or 2nd semester Core Elective Course
Lehrform / SWS / form of seminar / teaching hours per week:	3 teaching hours per week (en-bloc sessions) lecture and exercises
Arbeitsaufwand / student workload:	Attendance: 45 h (3 en-bloc sessions on Friday/Saturday) Private study: 105 h
Kreditpunkte / credit points:	5 ECTS
Voraussetzungen nach Prüfungsordnung/ preconditions according to examination regulations:	Excel skills
Modulziele / angestrebte Lernergebnisse / aims of the module / aspired learning outcome:	– Knowledge and understanding of important economic feasibility criteria for project evaluation and financing of energy projects – Ability to develop and interpret business plans for energy projects – Ability to evaluate investment projects with focus on cash flow simulation – Knowledge of a variety of financing schemes for investment projects and their special features – Knowledge of decision making criteria in Project Financing
Inhalt / subjects covered:	A. Investment analysis: Economic project valuation concepts, Discounted Cashflow calculations, key financial indicators, levelized cost of electricity, balance sheet and business case interpretation, modelling in Excel incl. exercises B. Financing: 1. general financing sources, options and criteria, framework and investor conditions 2. principles of corporate finance in relation to capital-intensive projects 3. principles of project financing

	4. assessment and optimisation of business cases for financing, incl. exercises in excel (for both corporate and project financing)
Studien- Prüfungsleistungen / form of examination:	Group Case (groups of 3-4 students) with report (15 pages + excel model) and group presentation (20min); Written or Oral examination (each student separate) (20 min)
Medienformen / media used:	Cash flow model in Excel Teaching: white board, power point slides, and excel (own laptops required)
Literatur / literature:	A.o. extracts from Brealey & Myers „Principles of Corporate Finance" (4th Edition), Extracts from McKinsey & Company, „Valuation", Finnerty, John D. (2007): Project Financing. Asset-Based Financial Engineering. Second edition. John Wiley & Sons. Böttcher, Jörg (2009) Finanzierung von Erneuerbaren-Energien-Vorhaben. Oldenbourg Wissenschaftsverlag GmbH Gatti, Stefano (2008) Project Finance in Theory and Practice. Designing, Structuring, and Financing Private and Public Projects. Academic Press Advanced Finance Series. Elsevier. Böttcher, Jörg; Blattner, Peter (2006) Projektfinanzierung. Oldenbourg Wissenschaftsverlag GmbH

Modul 28: Windparkprojektierung

Studiengang / course:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbezeichnung / module name:	Windparkprojektierung
ggf. Kürzel / abbreveation	
ggf. Untertitel / subtitle	
ggf. Lehrveranstaltungen / seminar:	
Semester / semester:	2.
Modulverantwortliche(r) / person in charge of module:	Prof. Dr. Olav Hohmeyer
Dozent(in) / person teaching the seminar:	Dipl.-Wi.-Ing. Michaela Bruns, Dipl.-Wi.-Ing. Ulf Ehlers
Sprache / language:	Deutsch
Zuordnung zum Curriculum / attribution to courses:	M. Sc. Energie- und Umweltmanagement Wahlpflichtveranstaltung 2. Semester
Lehrform / SWS / form of seminar / teaching hours per week:	3 SWS Vorlesung
Arbeitsaufwand / student workload:	Präsenzstudium: 45 h, in 3 Wochenendblöcken Eigenstudium: 105 h
Kreditpunkte / credit points:	5
Voraussetzungen nach Prüfungsordnung/ preconditions according to examination regulations:	
Modulziele / angestrebte Lernergebnisse / aims of the module / aspired learning outcome:	Die Studenten kennen wichtige Wirtschaftlichkeitskriterien und Indikatoren, rechtliche Rahmenbedingungen sowie Grundlagen zu Infrastruktur und Bau für die Projektierung von Windparks.
Inhalt / subjects covered:	1. Rechtliche Rahmenbedingungen 2. Wirtschaftlichkeitskriterien 3. Infrastruktur und Bau 4. Praxisbeispiele 5. Exkursion zur Windparkbaustelle 6. Berechnungen 7. Präsentationen
Studien- Prüfungsleistungen / form of examination:	Hausarbeit 15 Seiten / Präsentation 30 Minuten
Medienformen / media used:	Tafel Folien (Powerpoint, PDF)
Literatur / literature:	

Modul 29: Strategic Management: Theory and Practice

Studiengang / course:	MSc. Management Studies
Modulbezeichnung / module name:	Strategic Management: Theory and Practice
ggf. Kürzel / abbreviation	
ggf. Untertitel / subtitle	
ggf. Lehrveranstaltungen / seminar:	Strategic Management (3 SWS) Case Studies in Strategy (2 SWS)
Semester / semester:	2. Semester
Modulverantwortliche(r) / person in charge of module:	Prof. Dr. Susanne Royer
Dozent(in) / person teaching the seminar:	Prof. Dr. Susanne Royer
Sprache / language:	English
Zuordnung zum Curriculum / attribution to courses:	M.Eng. Energie- und Umweltmanagement / M.Eng. Energy and Environmental Management Elective Course for the second semester M.Eng.
Lehrform / SWS / form of seminar / teaching hours per week:	Lecture / 3 SWS Seminar / 2 SWS
Arbeitsaufwand / student workload:	75 contact hours and 225 hours of student work
Kreditpunkte / credit points:	10 ECTS
Voraussetzungen nach Prüfungsordnung/ preconditions according to examination regulations:	Admission to M. Eng. EEM

Modulziele / angestrebte Lernergebnisse / aims of the module / aspired learning outcome:	• In the lecture, students become familiar with the theoretical basics and concepts in the field of Strategic Management.
	• During the Case Study Seminar, students discuss the possibilities of application of the theoretical concepts to real cases (cases in strategy).
	• Competencies covered:
	  • problem solving skills
	  • ability for successful and targeted action
	  • specific professional knowledge
	  • interdisciplinary knowledge
	  • economic competence
	  • international competence
	  • methodological competence
	  • social and ethical responsibility
	  • self organisation skills
	  • ability to take criticism constructively
	  • ability to act strategically
	  • entrepreneurial thinking
	  • analytical thinking

Inhalt / subjects covered:	• Today, markets are influenced by many aspects, as for example customers, competitors, technologies as well as the increasing globalization. In order to survive in a

	corporate environment, entrepreneurs have to rethink and adjust continuously their actions towards and relationships to decisive customers. Students will understand the decisive factors of corporate success. • The module focuses on entrepreneurial decision making in realizing competitive advantages, e.g. decisions of entering new markets, increasing prices, product differentiation. Possible reactions of competitors and other stakeholders will be discussed. • Strategic Management is seen as an important basis to highlight and understand corporate decisions and developments. Case studies and discussions will link the theory to corporate reality.
Studien- Prüfungsleistungen / form of examination:	Oral involvement, literature studies, oral presentation and written report (lecture), preparation and presentation of case studies with corresponding written report (seminar)
Medienformen / media used:	Flipcharts, board, Power point
Literatur / literature:	• Barney, J. B.: Gaining and Sustaining Competitive Advantage, 4th Edition, Boston et al.: Pearson, 2011. • Besanko, D./Dranove, D./Shanley, M./Schaefer, S.: The Economics of Strategy, New York: Wiley, 2004: 383-408. • Royer, S.: Strategic Management and Online-Selling: Creating Competitive Advantage with Intangible Web Goods, 'Routledge Advances in Management and Business Studies', London/New York: Routledge, 2005: 68-109. • Royer, S./Waterhouse, J./Brown, K./Festing. M.: Employee Voice and Strategic Competitive Advantage in International Modern Public Corporations – an Economic Perspective, in: European Management Journal 26 (4), 2008: 234-246. • Dietl, H. M./Royer, S./Stratmann, U.: Value Creation Architectures and Competitive Advantage: Lessons from the European Automobile Industry, in: California Management Review 51 (3), 2009: 24-48. • Current Articles • Case Studies

Modul 30: Entrepreneurship: Theory and Practice

Studiengang / course:	MSc. Management Studies
Modulbezeichnung / module name:	Entrepreneurship: Theory and Practice
ggf. Kürzel / abbreviation	
ggf. Untertitel / subtitle	
ggf. Lehrveranstaltungen / seminar:	
Semester / semester:	2. Semester
Modulverantwortliche(r) / person in charge of module:	Prof. Dr. Susanne Royer
Dozent(in) / person teaching the seminar:	Prof. Dr. Susanne Royer
Sprache / language:	English
Zuordnung zum Curriculum / attribution to courses:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management Elective Course for the second semester M. Eng.
Lehrform / SWS / form of seminar / teaching hours per week:	Lecture and case studies/3 SWS
Arbeitsaufwand / student workload:	45 hours of teaching and 105 hours of student work
Kreditpunkte / credit points:	5 ECTS
Voraussetzungen nach Prüfungsordnung/ preconditions according to examination regulations:	Admission to M. Eng. EEM

Modulziele / angestrebte Lernergebnisse / aims of the module / aspired learning outcome:	• Students should learn how to start a business and to judge foundations of enterprises of others
	• Students learn how to identify new business ideas and to conceptualize, to plan, to finance and to manage them successfully
	• Competencies covered:
	  • problem solving skills
	  • ability for successful and targeted action
	  • specific professional knowledge
	  • interdisciplinary knowledge
	  • economic competence
	  • international competence
	  • intercultural competence
	  • methodological competence
	  • social and ethical responsibility
	  • self organisation skills
	  • project organisation skills
	  • ability to take criticism constructively
	  • ability to act strategically
	  • entrepreneurial thinking
	  • analytical thinking
	  • teamwork

Inhalt / subjects covered:	Students are introduced to the field of Entrepreneurship and get familiar with necessary steps

	to plan and start a business in a global surrounding. Contents are the behavior and the mental attitude of company founders as well as their skills and qualifications. Furthermore, students will become familiar with the "culture" of entrepreneurs and they will learn how to identify chances and risks, how to develop risk reducing strategies, how to identify first-mover-advantages (and disadvantages) as well as the importance of intellectual property.
Studien- Prüfungsleistungen / form of examination:	Oral involvement, literature studies, preparation and presentation of case studies, written paper
Medienformen / media used:	Flipcharts, board, Power point
Literatur / literature:	• Hisrich, R. D. & Peters; M. P.: Entrepreneurship, 8th ed., McGraw Hill, 2009. • Montanye, J. A.: Entrepreneurship, in: The Independent Review 10 (4), 2006: 547-569. • Zimmerer, T. W. & Scarborough, N. M.: Essentials of Entrepreneurship and Small Business Management, 4th Edition, Pearson Education, 2005. • Current Articles • Case Studies

Modul 31: Organizational Change and Development

Studiengang / course:	MSc. Management Studies
Modulbezeichnung / module name:	Organizational Change and Development
ggf. Kürzel / abbreviation	
ggf. Untertitel / subtitle	
ggf. Lehrveranstaltungen / seminar:	Wachstum, Wandel, Organisationsentwicklung (im SoSe) Innovationsmanagement (im WS)
Semester / semester:	Wird im SoSe und im WS (d.h. im ersten und zweiten Mastersemester) angeboten
Modulverantwortliche(r) / person in charge of module:	Prof. Dr. Thomas Behrends
Dozent(in) / person teaching the seminar:	Prof. Dr. Thomas Behrends
Sprache / language:	Deutsch
Zuordnung zum Curriculum / attribution to courses:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management Elective Course for the (first and) second semester M. Eng. EEM
Lehrform / SWS / form of seminar / teaching hours per week:	Seminar / 4 SWS
Arbeitsaufwand / student workload:	60 contact hours and 90 hours of student work
Kreditpunkte / credit points:	5 ECTS
Voraussetzungen nach Prüfungsordnung/ preconditions according to examination regulations:	wie bei MEng. EUM

Modulziele / angestrebte Lernergebnisse / aims of the module / aspired learning outcome:	• Die Studierenden erhalten einen umfassenden Einblick in die disziplinäre Vielfalt des Diskurses zum Phänomen organisationaler Innovations- und Veränderungsprozesse. Ausgehend von einer Vermittlung theoretischer Grundlagen werden die Teilnehmer für das Spannungsfeld von „deterministischem Wandel" und voluntaristischer Entwicklung" in Organisationen sensibilisiert und erlernen den reflektierten Umgang mit einschlägigen Instrumenten des betrieblichen Innovationsmanagements.
	
	• Competencies covered:
	  • problem solving skills
	  • ability for successful and targeted action
	  • life-long learning
	  • basic professional knowledge
	  • specific professional knowledge
	  • interdisciplinary knowledge
	  • economic competence
	  • political competence
	  • methodological competence

	• social and ethical responsibility • self organisation skills • ability for interdisciplinary thinking • ability to take criticism constructively • ability to act strategically • entrepreneurial thinking • analytical thinking
Inhalt / subjects covered:	Das Modul umfasst sowohl eine (organisations-)soziologisch informierte Erörterung einschlägiger theoretischer Erklärungen zum Verlauf organisationaler Wandel- und Entwicklungsprozesse als auch eine Einführung in die wesentlichen Erklärungs- und Gestaltungsansätze aus dem Bereich des organisationalen Lernens und Innovationsmanagements.
Studien- Prüfungsleistungen / form of examination:	Präsentation und Ausarbeitung
Medienformen / media used:	Flipcharts, Tafel, Power point
Literatur / literature:	• Blättel-Mink, B. (2006): Kompendium der Innovationsforschung, Wiesbaden • Jäger, W./ Meyer, H.-J. (2003): Sozialer Wandel in soziologischen Theorien der Gegenwart, Wiesbaden • Liebsch, B. (2011): Phänomen Organisationales Lernen: Kompendium der Theorien individuellen, sozialen und organisationalen Lernens sowie interorganisationalen Lernens in Netzwerken, München u. Mering • Poole, M.S./ Van de Ven A.H.(2004): Handbook of Organizational. Change and Innovation, New York

Modul 32: Unternehmenskommunikation

Studiengang/course:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbezeichnung / module name:	Unternehmenskommunikation
ggf. Kürzel / abbreviation	
ggf. Untertitel / subtitle	
ggf. Lehrveranstaltungen / seminar:	
Semester / semester:	Wintersemester
Modulverantwortliche(r) / person in charge of module:	Prof. Dr. Berthold H. Hass
Dozent(in) / person teaching the seminar:	Prof. Dr. Berthold H. Hass
Sprache / language:	Deutsch
Zuordnung zum Curriculum / attribution to courses:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management Wahlpflichtkurs
Lehrform / SWS / form of seminar / teaching hours per week:	Vorlesung mit integrierten Übungsanteilen und Gastvorträgen aus der Praxis/3 SWS
Arbeitsaufwand / student workload:	90 SWS Kontaktzeit, 60 SWS Selbststudium
Kreditpunkte / credit points:	5
Voraussetzungen / preconditions:	Zulassung zum Studiengang M.Eng. Energy and Environmental Management
Lernziele / Kompetenzen / aims of the module / competencies:	Die Vorlesung führt in die grundlegenden Fragen und Problembereiche der Unternehmenskommunikation ein. Studierende sollen die zentrale Bedeutung von Information und Kommunikation für arbeitsteiliges Wirtschaften verstehen lernen und sich wichtige Kommunikationstheorien aneignen. Sie sollen darüber hinaus diese Grundlagen und Konzepte in wichtigen Teilbereichen der Unternehmenskommunikation (Mitarbeiter, Kunden, Öffentlichkeit) anwenden können. Geförderte Kompetenzen: • Problemlösungsfähigkeit • Fähigkeit zu erfolgreichem und zielgerichtetem Handeln • Grundlagenwissen • Fachspezifisches Vertiefungswissen • Fachübergreifendes Vertiefungswissen • Ökonomische Kompetenz • Politische Kompetenz • Methodische Kompetenz • Gesellschaftliches und ethisches Verantwortungsbewusstsein • Fähigkeit zur Lösung von Konflikten • Fähigkeit zu fächerübergreifendem Denken • Strategische Handlungskompetenz • Fähigkeit zur interdisziplinären Kommunikation

	• Fähigkeit, analytisch zu denken
Inhalt / subjects covered:	• Einführung • Ökonomische Bedeutung von Information und Kommunikation • Theorien der Kommunikation • Medien- und Kommunikationswege • Kundenkommunikation • Mitarbeiterkommunikation
Studien- Prüfungsleistungen / form of examination:	Klausur
Medienformen / media used:	Power point
Literatur / basic literature for the module:	• Mast, Claudia (2010): Unternehmenskommunikation: Ein Leitfaden, 4. Aufl., Stuttgart (Lucius), 2010. • Meckel, Miriam / Schmid, Beat F. (2008): Unternehmenskommunikation: Kommunikationsmanagement aus Sicht der Unternehmensführung, 2. Aufl., Wiesbaden (Gabler), 2008. • Picot, Arnold / Reichwald, Ralf, / Wigand, Rolf T. (2003): Die grenzenlose Unternehmung: Information, Organisation und Management, 5. Aufl., Wiesbaden (Gabler), 2003.

Modul 33: Politics and Economics in the International Sphere

Studiengang / course:	MSc. Management Studies
Modulbezeichnung / module name:	Politics and Economics in the International Sphere
ggf. Kürzel / abbreveation	
ggf. Untertitel / subtitle	
ggf. Lehrveranstaltungen / seminar:	
Semester / semester:	Summer Term
Modulverantwortliche(r) / person in charge of module:	Prof. Dr. Stephan Panther
Dozent(in) / person teaching the seminar:	Prof. Dr. Stephan Panther
Sprache / language:	English
Zuordnung zum Curriculum / attribution to courses:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management Elective Course for the second semester
Lehrform / SWS / form of seminar / teaching hours per week:	Lecture and reading course / 3 SWS
Arbeitsaufwand / student workload:	150 hours: contact hours: 30 hours lecture, 15 hours reading course, student work: 45 hours of lecture preparations, 60 hours reading for the reading course
Kreditpunkte / credit points:	5 ECTS
Voraussetzungen nach Prüfungsordnung/ preconditions according to examination regulations:	none
Modulziele / angestrebte Lernergebnisse / aims of the module / aspired learning outcome:	Upon successful completion of the module, students should be able to work independently to research contexts in the field of international political economy. This is made possible on the basis of a thorough and in-depth survey of selected areas of the relevant research literature, making the central conceptual perspectives and their associated methodological and analytical tools to be learned. Purchase by the strong inter-disciplinary reference of the module, the students also expertise in the field of interdisciplinary dialogue (the ability to change perspective, appreciation of the complementary strengths of approaches, capacity for critical reflection of one's own disciplinary position). Competencies: • ability to solve problems • interdisciplinary in-depth knowledge • subject-specific in-depth knowledge • economic competence • political competence • international competence • methodological competence

	• social and ethical responsibility • interdisciplinary communication and thinking • analytical thinking • teamwork
Inhalt / subjects covered:	The module provides a thorough and in-depth overview of selected areas of the relevant research literature on international political economy. This "inter-discipline" (Lake) was formed in the past decade in the intersection between political science and economics and focuses on the interactions between international politics and international economics. Thia is responding to an increasingly globalized economy and politics. The focus is on International organizations, the organization globalized supply chains, or the effects of international economic relations on national policy. The starting points are textbooks. Especially in the semester-long reading course this is deepened by the reading and discussion of original texts. Recent reviews are considered as well. Interdisciplinary references, especially between political science and economics, are another key component of the module.
Studien- Prüfungsleistungen / form of examination:	Written semester report, oral presentations
Medienformen / media used:	Flipcharts, board, power point
Literatur / literature:	Required reading: • Ravenhill, John (2011), "Global Political Economy", 3rd edition, Oxford University Press. • Selected recent reviews

Modul 34: The Social and Cultural Embeddedness of Economies

Studiengang / course:	MSc. Management Studies
Modulbezeichnung / module name:	The Social and Cultural Embeddedness of Economies
ggf. Kürzel / abbreveation	
ggf. Untertitel / subtitle	
ggf. Lehrveranstaltungen / seminar:	
Semester / semester:	Winter Term
Modulverantwortliche(r) / person in charge of module:	Prof. Dr. Stephan Panther
Dozent(in) / person teaching the seminar:	Prof. Dr. Stephan Panther
Sprache / language:	English
Zuordnung zum Curriculum / attribution to courses:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management Elective Course for the second semester
Lehrform / SWS / form of seminar / teaching hours per week:	Lecture and reading course / 3 SWS
Arbeitsaufwand / student workload:	150 hours: contact hours: 30 hours lecture, 15 hours reading course, student work: 45 hours of lecture preparations, 60 hours reading for the reading course
Kreditpunkte / credit points:	5 ECTS
Voraussetzungen nach Prüfungsordnung/ preconditions according to examination regulations:	none
Modulziele / angestrebte Lernergebnisse / aims of the module / aspired learning outcome:	After taking the course, students should be able to independently elaborate research contexts in the field of the social and cultural embeddedness of economies. This is made possible on the basis of a thorough and in-depth survey of selected areas of the relevant research literature, and by learning the central conceptual perspectives and their associated methodological and analytical tools. Due to the strong interdisciplinary reference of the module, students also acquire expertise in the interdisciplinary dialogue (the ability to change perspective, appreciation of the complementary strengths of approaches, capacity for critical reflection of one's own disciplinary position). Competencies: • ability to solve problems • interdisciplinary in-depth knowledge • subject-specific in-depth knowledge • economic competence • political competence • international competence • intercultural competence

	• methodological competence • social and ethical responsibility • interdisciplinary communication and thinking • analytical thinking
Inhalt / subjects covered:	The module provides a thorough and in-depth overview of selected areas of the relevant research literature on social and cultural embeddedness of the economy. The starting point is survey literature that exists in book form as well. Especially in the semester-long reading course this is deepened by the reading and discussion of original texts. Here are the milestones for a discussion and for recent scientific contributions to the course. Interdisciplinary references, especially to the sociological debate, are another key component of the module.
Studien- Prüfungsleistungen / form of examination:	Exam, oral short presentations
Medienformen / media used:	Flipcharts, board, power point
Literatur / literature:	Required reading: • Beugelsdijk, Sjoerd und Maseland, Robbert (2011) „Culture in Economics“, Cambridge University Press. • Selected key texts and recent reviews Recomended reading (selection): • Swedberg, Richard (2003) „Principles of Economic Sociology“, Princeton University Press. • Portes, Alejandro (2010), „Economic Sociology“, Princeton Universitäy Press.

Modul 35: Ressourceneffizienz (inkl. Energieeffizienz): zentrale Herausforderungen für eine erfolgreiche Nachhaltigkeitspolitik

Studiengang / course:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbezeichnung / module name:	Ressourceneffizienz (inkl. Energieeffizienz): zentrale Herausforderungen für eine erfolgreiche Nachhaltigkeitspolitik
ggf. Kürzel / abbreveation	Ress
ggf. Untertitel / subtitle	
ggf. Lehrveranstaltungen / seminar:	
Semester / semester:	2. Semester
Modulverantwortliche(r) / person in charge of module:	Dr. habil. Kora Kristof (laufendes APl-Verfahren an der Universität Flensburg)
Dozent(in) / person teaching the seminar:	Dr. habil. Kora Kristof
Sprache / language:	Deutsch
Zuordnung zum Curriculum / attribution to courses:	M.Eng. Energie- und Umweltmanagement / M.Eng. Energy and Environmental Management
Lehrform / SWS / form of seminar / teaching hours per week:	Blockseminar / 3 SWS
Arbeitsaufwand / student workload:	45 Stunden Präsenzstudium und 105 Stunden Eigenstudium, Gruppenarbeit und Prüfungsvorbereitung; Summe: 150 Stunden
Kreditpunkte / credit points:	5
Voraussetzungen nach Prüfungsordnung/ preconditions according to examination regulations:	Zulassung zum M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Empfohlene Voraussetzungen / recommended preconditions	Einlesen in empfohlene Literatur (Links s.u.)

Modulziele / angestrebte Lernergebnisse / aims of the module / aspired learning outcome:	Inhaltliche Modulziele:
	• Einführung in das Thema Ressourceneffizienz (inkl. Energieeffizienz)
	• Einführung in politische Prozesse (inkl. Stakeholderbeteiligung) zur erfolgreichen Einführung neuer Politiken
	
	Methodische Modulziele / Schlüsselqualifikationen / Kompetenzentwicklung:
	• Status-Quo-Analysen
	  ○ Recherchestrategien
	  ○ Strategien zur Informationsverarbeitung
	• Entwicklung von Politikvorschlägen und Ansatzpunkte zu deren Umsetzung und Vermarkung

	○ Entwicklung kreativer Lösungen ○ Strukturierung und inhaltliche Schwerpunktsetzung ○ Erfolgsfaktoren für die politische Umsetzung und für Stakeholderprozesse • Diskussionsstrategie für politische und Stakeholderprozesse ○ Anforderungen an Präsentationsunterlagen ○ Präsentation und Positionierung in Stakeholderdialogen • Organisation der Teamarbeit ○ Projektplanung und -management ○ Erfolgreiche Zusammenarbeiten und professionelle Diskussionskultur in Teams (inkl. Konfliktlösungsstrategien)
Inhalt / subjects covered:	Im ersten Teil des Blockseminars wird ein Überblick über die ganze Breite der Ressourceneffizienz (inkl. Energieeffizienz) gegeben – Potentiale, Ziele, derzeitige Politik und Politikoptionen – und die aktuellen Ansätze zur Ressourceneffizienzpolitik auf EU- und nationaler Ebene vorgestellt. Dabei wird auch die Entstehung von Politiken aus dem Blickwinkel einzelner Stakeholder thematisiert und damit ein Eindruck von komplexen politischen Meinungsbildungsprozessen vermittelt. Im zweiten Teil werden in Kleingruppen – mit Unterstützung durch die Dozentin – Ansätze für eine geschlossene Ressourceneffizienzpolitik für ressourcenpolitische Kernstrategien am Beispiel spezifischer Materialien entwickelt. Nicht-erneuerbare Rohstoffe, erneuerbare Rohstoffe, Wasser, Fläche sind dabei besonders interessante Anwendungsbereiche. Die Studierenden werden dabei in vier Schritten vorgehen: • Erstens verschaffen sie sich einen Überblick über den Status Quo zu Problemlage, Handlungsnotwendigkeiten und -möglichkeiten in dem von ihnen ausgewählten Bereich. • Zweitens werden sie die Nutzbarkeit und Übertragbarkeit der aktuellen Ansätze zur Energie- und Materialeffizienz analysieren. • Auf dieser Basis werden sie drittens eine spezifische Ressourceneffizienzpolitik für den von ihnen gewählten Bereich in der Kleingruppe entwickeln und diskutieren. • Das Ergebnis werden sie viertens in der Gesamtgruppe präsentieren und diskutieren. In den letzten beiden Schritten können die Studierenden auch das im ersten Teil erworbene Wissen zu Stakeholderprozessen bei der Entwicklung von Politikansätzen anwenden.
Studien-Prüfungsleistungen / form of examination:	Mündliche Präsentation der Teamergebnisse (mit Unterstützung einer Powerpointpräsentation) und schriftlicher Report der Teamergebnisse im Rahmen eines 15 bis 20 Seiten Papers
Medienformen / media used:	Vorlesung mit Powerpointpräsentation mit intensiver Beteiligung der Studierenden und Gruppenarbeit in kleinen Teams
Literatur / literature:	Linkliste zur Vorbereitung Überblick EU Ressourcen- und Energieeffizienzpolitik • http://europa.eu/scadplus/leg/en/s14003.htm • http://ec.europa.eu/energy/efficiency/index_en.htm

	• http://europa.eu/scadplus/leg/en/s15001.htm • http://europa.eu/scadplus/leg/en/lvb/l28167.htm • http://ec.europa.eu/environment/eussd/escp_en.htm • http://ec.europa.eu/environment/natres/index.htm Intermediäre Ressourceneffizienzakteure aus Deutschland • Netzwerk Ressourceneffizienz / ZRE: www.netzwerk-ressourceneffizienz.de • Deutsche Materialeffizienzagentur: www.materialeffizienz.de/ • EffizienzAgentur NRW: www.efanrw.de • PIUS-Netzwerk: www.pius-info.de Daten • Eurostat: http://epp.eurostat.ec.europa.eu/portal/page?_pageid=1090,30070682,1090_33076576&_dad=portal&_schema=PORTAL • BGR: www.bgr.bund.de • MIPS berechnen: www.wupperinst.org/de/projekte/themen_online/mips/index.html Wissenschaftlicher Hintergrund • MaRess-Projekt: http://ressourcen.wupperinst.org

Modul 36: Energierecht

Studiengang / course:	M. Eng. Energie- und Umweltmanagement / M.Eng. Energy and Environmental Management
Modulbezeichnung / module name:	Energierecht / Energy law
ggf. Kürzel / abbreviation	
ggf. Untertitel / subtitle	
ggf. Lehrveranstaltungen / seminar:	
Semester / semester:	1. oder 2. Semester
Modulverantwortliche(r) / person in charge of module:	Prof. Dr. Olav Hohmeyer
Dozent(in) / person teaching the seminar:	Dipl.-Wi.-Ing. Sönke Dibbern
Sprache / language:	Deutsch / English
Zuordnung zum Curriculum / attribution to courses:	M. Eng. Energy and Environmental Management 1st or 2nd Semester Core Elective Course
Lehrform / SWS / form of seminar / teaching hours per week:	3 SWS Seminar (3 teaching hours per week)
Arbeitsaufwand / student workload:	Präsenzstudium: 45 h, in 3 Wochenendblöcken Eigenstudium: 105 h
Kreditpunkte / credit points:	5 CP
Voraussetzungen nach Prüfungsordnung/ preconditions according to examination regulations:	Keine
Modulziele / angestrebte Lernergebnisse / aims of the module / aspired learning outcome:	Erwerb von Basiskenntnissen im deutschen und europäischen Energierecht. Die Studierenden sollen befähigt werden, in ihren Berufen auftretende rechtliche Zusammenhänge zu erkennen, zu analysieren und dafür auch jeweils unterschiedliche Lösungsansätze finden zu können. Lösungsangebote Dritter, auch die des eigenen Rechtsberaters, sollen eingeschätzt und kompetent diskutiert werden können.
Inhalt / subjects covered:	• Einführung in die Rechtswissenschaft (u.a. Quellen und Erscheinungsform des Rechts, juristische Methodenlehre); • Europarecht (u.a. Arten des Gemeinschaftsrechts, innerstaatliche Wirkungen des Gemeinschaftsrechts); ***Energierecht*** • Gegenstand und Geltungsbereich des Energierechts, systematische Einordnung • Energieversorgung als öffentliche Aufgabe - Gemeindewirtschaftsrecht • Energiewirtschaftsgesetz - Ziele - Versorgungspflicht

	- Unbundling - Preisrecht, Anreiz-Regulierung - Wegerecht / Konzessionsabgaben • Energieliefervertrag, Netznutzung durch Dritte • Erneuerbare-Energien-Gesetz - Ziele - Hauptpflichten des Netzbetreibers - Gesetzliche Vergütung als Beihilfe ? - Netzanschlussvoraussetzungen - Alternative (sog. marktnahe) Vermarktungsinstrumente im EEG • Untergesetzliche technische Regelwerke EE-Anlagen - *Zulässigkeit nach Bauplanungs-, Bau-, Immissionsschutz- und Naturschutzrecht; gesetzliche Privilegierung*
Studien- Prüfungsleistungen / form of examination:	Klausur
Medienformen / media used:	Folien
Literatur / literature:	- Gesetzestexte und andere Rechtsnormen (z.B. in der Reihe Beck-Texte im dtv). - Horn, Norbert (1996): Einführung in die Rechtswissenschaft und die Rechtsphilosophie. C.F.Müller Verlag Heidelberg. - Hans-Joachim Koch (Hrsg., 2010): Umweltrecht, 3. Auflg.; Vahlen, München - Franz Jürgen Säcker (Hrsg., 2010): : Berliner Kommentar zum Energierecht, 2.Aufl.;, Verlag Recht und Wirtschaft, Frankfurt a.M. - Zeitschrift für neues Energierecht, Ponte Press, ISSN 1434-3339

Modul 37: Sustainable Energy Planning in Rural Areas

Studiengang:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbezeichnung:	Sustainable Energy Planning in Rural Areas
ggf. Kürzel	SEPRA
ggf. Untertitel	
ggf. Lehrveranstaltungen:	
Semester:	The module takes place in the first semester and is offered once in a year.
Modulverantwortliche(r):	Prof. Dr. August Schläpfer
Dozent(in):	Prof. Dr. August Schläpfer Dipl. Ing. Wulf Boie Ass. Prof. Bernd Möller, Aalborg University
Sprache:	English
Zuordnung zum Curriculum	M. Eng. SESAM, 1. Semester, Compulsory Module
Lehrform / SWS:	2 SWH seminar, max. 24 students/group 2 SWH Planning Exercise, max 24 students/group The seminar consists of inputs through lectures and moderated working sessions. The students have to prepare small presentations on selected topics. These can be done in small groups or individually, depending on the topic. The seminar is complemented by a case study which allows the students to practice the knowledge acquired from these inputs. A fine-tuning of the seminar contents will take place at the beginning of the seminar in order to incorporate the knowledge and experience of students who dispose of professional experience in the fields concerned.
Arbeitsaufwand:	Attendance: approx. 60 hours Self-study/Group wok: approx. 90 hours
Kreditpunkte:	5
Voraussetzungen:	Successful completion - of at least two technical modules in the first semester - of the first course in the ProPlaMID-Module - of the Business Studies and economics Module in the first semester.

Lernziele / Kompetenzen:	The overall goal of the module is to enable students to consult stakeholders in rural energy planning processes and to moderate such processes. The module thereby complements the competencies gained in the technical and management module of the fist semester. Specific objectives The students - are able to critically reflect the interrelation between energy, environment, social and economic development in rural areas - understand the relevance of stakeholder involvement and participation in rural energy planning - know the different approaches to rural energy planning - are able to design and apply tools and instruments for data collection - are able to assess local energy demand and resources - are able to develop and assess local energy scenarios - can draft energy programme and project proposals
Inhalt:	The module focuses on energy planning in rural areas of developing countries. After introducing the interrelationship between rural development and energy and different planning approaches, it emphasizes the different steps of a participatory rural energy planning process. The theoretical course is complemented with a comprehensive case study and planning exercise. Contents • Rural Development and Energy Planning - Rural Demographics - Economic Development and Energy - Social Development and Energy - Environment and Rural Energy • Community Mobilisation • Participatory Approaches to Rural Energy Planning • Community Energy Planning • Integrated Resource Planning • The Rural Energy Planning Process - Assessment of Baseline Situation Resources, Demand and Technologies Data Sources Rural Energy Uses - Development Scenarios - Local Energy Strategies and Policies - Energy programmes and Projects for Rural Development • Institutional Aspects • Planning Exercise
Studien- Prüfungsleistungen:	Presentation (30 min) and written paper (approx. 15

	pages) Alternatively, if too many students attend the course, the presentation can be replaced by a more extensive written paper (approx. 30 pages)
Medienformen:	Media • Power point presentation, Flip chart, Pin board, cards,transparencies, Notebooks/Planning tools • Handouts, e-books, exercises and weblinks are available on BSCW-server
Literatur:	- Singh, S. and Bajpai, U. (2010) Integrated energy planning for sustainable development in rural areas: A case study from Eastern Uttar Pradesh, Energy and Environment, Vol.1, Issue 6, pp.1083-1096, Journal homepage: www.IJEE.IEEFoundation.org - Tsoutsos, T. et. al. (2009) Sustainable energy planning by using multi-criteria analysis applicationenergy planning by using multi-criteria analysis application in the island of Crete, Energy Policy, Vol.37, 1587–1600, journalhomepage: www.elsevier.com/locate/enpol - Lund, H. (2007) EnergyPLAN - Advanced Energy Systems Analysis Computer Model, Documentation Version 7.0, Aalborg University, Denmark - Economic and Social Commission for Asia and the Pacific (2003): Guidelines on the Integration of Energy and Rural Development Policies and Programmes, New York, United Nations - Basnet, Suman (1999): District energy planning and implementation guidelines, Lalitpur, Rural Energy Development Programme - Kleinpeter, Maxime (1996): Energy planning and policy, Chichester, Wiley - Swisher, Joel N.; de Martino Jannuzi, Gilberto and Redlinger, Robert Y. (1997): Tools and Methods for Integrated Resource Planning- Improving Energy efficiency and Protecting the Environment, UNEP/Risø National Laboratory

Modul 38: Renewable Energy I: Hydro and Wind Energy

Studiengang / course:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbezeichnung / module name:	Renewable Energy I: Wind and Hydro Power
ggf. Kürzel / abbreviation	RenI
ggf. Untertitel / subtitle	-------
ggf. Lehrveranstaltungen / seminar:	Wind Energy Hydro Power System integration of Renewable Electricity
Semester / semester:	1
Modulverantwortliche(r) / person in charge of module:	Dipl.-Ing. Wulf Boie
Dozent(in) / person teaching the seminar:	Dr. Hermann van Radecke Dipl.-Ing. Wulf Boie M. Eng. Italo Flores Zambrano
Sprache / language:	English
Zuordnung zum Curriculum / attribution to courses:	EEM developing countries: core elective
Lehrform / SWS / form of seminar / teaching hours per week:	Seminar 4 contact hours per week
Arbeitsaufwand / student workload:	Wind energy 20 contact hours, 30 hours individual work Hydro Power 20 contact hours, 30hours individual work Integration 20 contact hours, 30 hours individual work 10 free contact hours for each topic for individual or team supervision of case studies and exercises
Kreditpunkte / credit points:	5 CP
Voraussetzungen nach Prüfungsordnung/ preconditions according to examination regulations:	---
Modulziele / angestrebte Lernergebnisse / aims of the module / aspired learning outcome:	The students - understand the basic science and technical function of converting wind and water flow into mechanical and then electrical energy - can analyse potentials of wind energy and hydropower based on meteorological, geomorphic and topographical conditions - are capable to judge the basic economic feasibility of wind and hydro power plants - understand the issues related to the integration of renewable energy into electricity supply systems
Inhalt / subjects covered:	The module emphasises on hydro and wind energy in grid connected and decentralised systems. Wind Energy • Basics of Meteorology and Turbine Site Assessment: • Origin of wind, local winds

	• Wind data assessment, description of wind speed, • Statistic Rayleigh and Weibull • Geography of a site • Roughness of terrain, obstacles • Variation of wind speed with height, logarithmic profile • Aerodynamics and Energy Content of Wind: - Principle of wind rotors, lift and resistance, Cp-coefficient - Stall and pitch control - Fast and Slow-Runners, Tip speed ratio • Calculation of Annual Energy Production • Wind Power Technology: Technical components, tower, blades, gear, generator, brakes • Wake calculation in Wind Parks for Park efficiency • From battery charger to on-shore parks to off-shore wind parks • Grid connection, conditions and requirements • Software Tools • Case studies: - Wind Potential, energy, noise, shadow, visual impact Hydropower • Basics - The hydrological cycle - global hydropower potential - types and categories of hydropower plants • cost of energy from micro and mini hydro power plants - investment cost and cost distribution - the plant factor - comparison of micro and mini hydropower plants with other conventional and renewable options • Planning of isolated Hydro power Plants - planning procedure - demand Assessment and demand forecast - assessment of hydropower potential: area rainfall method and flow correlation method • Components of Micro Hydro Power Plants - civil engineering and penstock: design criteria, types and calculation of power canals and penstocks - Turbines: types and selection criteria for turbines, basic calculations - Case study: assessment of hydropower potential and demand, selection plant type, selection and dimensioning of canal, penstock and turbine, balancing demand and supply Integration • Basic concepts of electrical systems - Definitions: current, voltage, power, energy, power factor, losses on line, capacitance, inductance, transformers, generator, Transmission lines

	(medium and high voltage), electrical network design. - Power Quality: harmonics, flicker, voltage dips, Transients and Frequency variations. • Concepts of electrical power systems Operation - Electricity market operation, load forecasting, supply dispatch (hydro, Wind power and solar PV), Importance of the power quality, supply demand balance in the power systems, frequency control, voltage control. • Distribute generation Systems - Distribute generation (DG) with renewable technologies (Small and large Hydro power plants, Wind Turbines, Solar PV, CSP, Biogas), distributed energy resources, DG benefits, forms of energy storage (Batteries, Hydrogen, Pumped water) and smart grids. • Previous analysis for integration to the electricity grids of renewable technologies - Power flow analysis, Short circuit analysis, optimal power flow studies, Safety studies (Contingency analysis N-1) and stability studies (dynamic). • Requirements for integration to the electricity grid of renewable technologies - Revision of standards for the Grid integration from Germany (VDEW Guideline) and Denmark (IEC draft guideline 61400-21) and new technologies to meet the requirements. • Case study: Integration to the Grid of Wind Turbine and Solar PV technologies.
Studien- Prüfungsleistungen / form of examination:	Written test at the end of the term (2 hours)
Medienformen / media used:	Black-/ whiteboard, Powerpoint presentations and hand outs, practical calculations, functional objects, practical experiments, excursion WTG Campus, Notebooks/Software simulation tools
Literatur / literature:	Wind Energy - Manwell, J. F. et. al.: Wind Energy Explained., Chichester, 2009 - Heier, S.: Grid Integration of Wind Energy, 1996 - Burton, T.: Wind energy handbook, Chichester, 2002 - Troen, I., Petersen, E. L.: European Wind Atlas. Risoe Nat. Lab., 1991, - Gasch, R., Twele, J.: Wind Power Plants. Fundamentals, Design, Construction and Operation. Solarpraxis AG, Berlin, 2002 Hydropopwer - Harvey, A. (2002): Micro-Hydro Design Manual, ITPublications Ltd., London (Library) - DCS - Technology Development (1998): Manual for Survey and Layout Design of Private Micro-hydropower

	Plants, International Centre for Integrated Mountain Development (ICIMOD)Kathmandu, Nepal (BSCW) - Penche, Celso (1998): Laymans Handbook on how to develop a small hydro site - A handbook prepared under contract for the Commission of the European Communities,Directorate-General for Energy by European Small Hydropower Association (ESHA), (Second Edition) - Arter, A./Meier, U. (SKAT)(1990): Hydraulics Engineering Manual; St.Gallen (Library) Integration - Michel Crapper, (2008): Electric Power Systems, Wiley. - H. Wayne Beaty, (2001): Handbook of Electric Power calculations, Third edition, McGraw Hill. - Ali Keyhani, Mohammad N. Marwali M. D., (2010): Integration of Green and Renewable Energy in Electric Power Systems, Wiley. - Gilbert M. Masters, (2004): Renewable and Efficient Electric Power Systems, Wiley Interscience, Stanford University. - Brendan Fox, Damien F. Leslie B. Nick J. David M. Richard W. and Olimpo A. (2007): Wind power integration: connection and system operational aspects, IET. - M. Shahidehpour, Hatim Yamin, Zuyi Li (2002): Market operations in electric power systems: forecasting, scheduling, and Risk Management, Wiley Interscience. - Remus Teodorescu,Marco Liserre,Pedro Rodríguez,Frede Blaabjerg (2011): Grid Converters for Photovoltaic and Wind Power Systems, Wiley

Modul 39: Renewable Energy II: Bio Energy and Solar Energy

Studiengang / course:	M. Eng Energie- und Umweltmanagement/ M. Eng. Energy and Environmental Management
Modulbezeichnung / module name:	Renewable Energy II: Bio Energy and Solar Energy
ggf. Kürzel / abbreviation	
ggf. Untertitel / subtitle	
ggf. Lehrveranstaltungen / seminar:	
Semester / semester:	1st or 2nd semester
Modulverantwortliche(r) / person in charge of module:	John Kuteesakwe
Dozent(in) / person teaching the seminar:	John Kuteesakwe, MSc Dipl.-Wi.-Ing. Sönke Bohm M.Eng. Italo Flores Zambrano
Sprache / language:	English
Zuordnung zum Curriculum / attribution to courses:	EEM developing countries: core elective
Lehrform / SWS / form of seminar / teaching hours per week:	Seminar with lab 4 contact hours per week
Arbeitsaufwand / student workload:	Bioenergy 20 contact hours, 30 hours individual work Solar Energy 20 contact hours, 30 hours individual work Integration 20 contact hours, 30 hours individual work 10 free contact hours for each topic for individual or team supervision supervision of case studies and exercises
Kreditpunkte / credit points:	5
Voraussetzungen nach Prüfungsordnung/ preconditions according to examination regulations:	
Empfohlene Voraussetzungen / recommended preconditions	

Modulziele / angestrebte Lernergebnisse / aims of the module / aspired learning outcome:	Biomass Aim: Students acquire general technical knowledge and intellectual capacity to plan, analyse and interpret bio energy issues. Specific Objectives Students acquire the basic knowledge about the potential and limitations of biomass as a renewable energy, the dynamics of its resource base, conversion and utilization in various forms in different regions, and the resulting socio-economic, health and environmental impacts. Students acquire technical knowledge on the biogas energy technology, including the biochemical processes of anaerobic digestion, the design and construction of digesters, the management and utilization of the gas and the slurry, and the planning in relation to demand and supply. Students have an overview of the different types and categories of biofuels, the drivers, barriers and opportunities for their development, biofuel production impacts on food production, the environment and society. Solar Energy Aim: Students acquire general technical knowledge and intellectual capacity to plan, analyse and interpret solar energy issues (both photovoltaic and solar thermal). Specific Objectives Students acquire the basic knowledge about the potential and limitations of solar energy as a renewable energy, the dynamics of its resource base, its potential and utilization in various forms in different regions, and the resulting socio-economic impacts. Students acquire technical knowledge of solar energy technologies, including the physical processes in photovoltaics, the design and construction of photovoltaic and solar thermal plants, and the planning in relation to demand and supply. Students have an overview of the different types and categories of solar energy technologies, the drivers, barriers and opportunities for their development. Integration Aim The overall goal of course is that students acquire the knowledge needed to integration to the grid of renewable technologies. Specific Objectives The students acquire the basic knowledge of electrical system components

	able to design the connection to the electricity grid of renewable technologies know the new challenges that are facing the electricity grid with the new concept of distributed generation know the operation of electrical systems with the inclusion of renewable technologies into the system know what are the limitations of renewable technologies to connect to the electricity grid. Are able to do the electrical studies to connect renewable technologies into the grid. know of the requirements for the connection of renewable technologies according to the Europeans standard.
Inhalt / subjects covered:	Bioenergy Biomass biomass description and its contrast to other renewable energy options basic definitions, measurements and conversions (energy flows), biomass types, use-categories and conversion into various forms factors influencing traditional biomass energy consumption, the cost of traditional biomass utilization: social, economical and health global and regional biomass consumption trends and projections of the biomass energy resource base (the forest), stock, density, productivity, availability and sustainability, renewable and non-renewable biomass, carbon-dioxide sequestration biomass energy strategy (with emphasis on stove dissemination) and role in the achievement of the MDGs fundamental concepts on efficient biomass stove design: stove efficiency, combustion, heat transfer, efficient cooking practices, stove testing protocols charcoal: formation, quality, production process, value chain, burning and design principles for improved charcoal stoves the carbon markets for improved stoves: methodologies b) Biogas basics: anaerobic fermentation, composition and properties and benefits and constraints of biogas technology the biochemical process: microbiological steps of biogas production, mechanism of the reactions, substrate physical and chemical change and parameters influencing anaerobic digestion determining energy demand and sizing the digester of a biogas plant design (types of plants) and construction (materials, siting, construction process and piping system) management: utilization of gas and slurry, general management, balancing production and energy demand and framework conditions c) Biofuel basics: definitions, different types and categories of biofuels technical overview of ethanol and biodiesel performance, efficiency and quality

	biofuel production process and technology feedstocks biofuel for combustion engine the demand, drivers, barriers and opportunities for biofuel the value chain economic analysis food versus energy the crosscutting nature of biofuel environmental and social impacts regulatory framework global biofuel programs plant site selection Solar energy a) Basics of solar energy solar potential, solar spectrum, irradiance, insolation and global radiation seasonal and daily variations of solar energy, solar azimuth and altitude, ecliptic angle and tilt of solar plants b) Photovoltaics (PV) Basics: semiconductor materials for solar cells, the photovoltaic effect, wafer production, I-V curve, effiency, serial and parallel connections, maximum power point (MPP), temperature coefficients, PV modules and arrays, standard conditions (STC, SOC) System components: mounting structures (racks, trackers), fastening elements, concentrator PV systems, system components for energy storage, different battery types, discharge rates, battery connection, specific storage cost, discharge protection, charge controllers cables, grounding, lightning protection, fuses inverters for AC and grid connection Systems: Installations and protection techniques, Solar pumping systems, pumping technology, energy requirements System planning, design of solar home systems (SHS) and decentralised off-grid systems based on local solar data and demand profiles Misc.: Software tools for solar PV systems, software tools for meteorological data Recycling and life cycle analysis of PV systems Market development, energy pay-back time, price evolution, support schemes Rural electrification case studies c) Solar Thermal Overview of solar thermal technology: Solar ponds, solar

	chimney, parabolic mirror, parabolic trough heliostat, solar collectors Basics of solar water heating systems: - Economic feasibility of solar water heating systems - Basic system concepts - Energy demand for water heating - Optical and thermal efficiency of solar collectors - Systems efficiency and solar fraction - the collector equation Technical components - Special system concepts - Solar collectors - Storage systems - Control systems - Heat exchangers - Pumps - Expansion tanks, safety valves and other components Systems design - Design and dimensioning of solar water heating systems - Solar space heating - Software Tools for Design of solar water heating systems Integration Basic concepts of electrical systems Definitions: current, voltage, power, energy, power factor, losses on line, capacitance, inductance, transformers, generator, Transmission lines (medium and high voltage), electrical network design. Power Quality: harmonics, flicker, voltage dips, Transients and Frequency variations. Concepts of electrical power systems Operation Electricity market operation, load forecasting, supply dispatch (hydro, Wind power and solar PV), Importance of the power quality, supply demand balance in the power systems, frequency control, voltage control. Distribute generation Systems Distribute generation (DG) with renewable technologies (Small and large Hydro power plants, Wind Turbines, Solar PV, CSP, Biogas), distributed energy resources, DG benefits, forms of energy storage (Batteries, Hydrogen, Pumped water) and smart grids. Previous analysis for integration to the electricity grids of renewable technologies Power flow analysis, Short circuit analysis, optimal power flow studies, Safety studies (Contingency analysis N-1) and stability studies (dynamic). Requirements for integration to the electricity grid of renewable technologies Revision of standards for the Grid integration from Germany (VDEW Guideline) and Denmark (IEC draft guideline 61400-21) and new technologies to meet the requirements. Case study: Integration to the Grid of Wind Turbine and Solar PV

	technologies.
Studien- Prüfungsleistungen / form of examination:	Assessment of students the students comprehension of the subject matter is tested through a written test, while participation, performance, study of relevant literature and internet sites is tested through a visualised and interactive presentation and facilitation of an exercise based on individual or group work preparation, elaboration on the presented topic in a written paper (15 pages).
Medienformen / media used:	A wide spectrum of media is used, such as books, videos and planning documents, laptops/internet and beamer for power point presentation, OHP transparencies, flip chart, posters, workshop cards, markers, black board
Literatur / literature:	Biomass/Biogas - Klass, Donald L. (1998): Biomass for Renewable Energy, Fuels, and Chemicals - Quaak, Peter et al (1999): Energy from Biomass - A Review of Combustion and Gasification Technologies (World Bank Technical Paper), Washington DC - Levine, Joel S. (1996): Biomass Burning and Global Change, Vol. 1: Remote Sensing and Modeling of Biomass Burning, and Biomass Burning in the Boreal Forest - Levine, Joel S. (1996): Biomass Burning and Global Change, Vol. 2: Biomass Burning in the Tropical and Temperate Ecosystems - ARECOP Asia Regional Cookstove Program (2001): Asia Industrial and Institutional Stove Compendium, Yogyakarta, Indonesia - Usinger, Jürgen (1999): Project and stove design for large scale cooking in developing countries : a guide book, GTZ Deutsche Gesellschaft für Technische Zusammenarbeit, Eschborn - Ross, Charles C. & Drake, Thomas Jefferson (1996): Handbook of Biogas Utilization (2nd ed.) Biofuels and Combustion Engines - Heywood, John B. (1988): Internal combustion engine

	fundamentals, New York , McGraw-HillMilton, Brian E. (1995): Thermodynamics, combustion and engines, London - Tickell, Joshua (2003): From the Fryer to the Fuel Tank-The Complete Guide to Using Vegetable Oil as an Alternative Fuel, 3rd edition, New Orleans - Mitzlaff. Klaus von (1988): Engines for biogas : theory, modification, economic operation ; Deutsches Zentrum für Entwicklungstechnologien, GATE in: Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH, Braunschweig, Vieweg, - National Renewable Energy Laboratory: Learning about Renewable Energy http://www.nrel.gov/learning/re_biofuels.html - Kaupp, Albrecht and Goss, John R. (1984): Small scale gas producer-engine systems : Deutsches. Zentrum für Entwicklungstechnologien - GATE in: Deutsche. Gesellschaft für Techn. Zusammenarbeit (GTZ) GmbH, Braunschweig Solar Energy Masters, Gilbert M.: Renewable and Efficient Electric Power Systems Kaltschmitt, Martin: Renewable Energy – Technological Foundations, Economical and Environmental Aspects Quaschning, Volker: Understanding Renewable Energy Systems Integration Michel Crapper, (2008): Electric Power Systems, Wiley. H. Wayne Beaty, (2001): Handbook of Electric Power calculations, Third edition, McGraw Hill. Ali Keyhani, Mohammad N. Marwali M. D., (2010): Integration of Green and Renewable Energy in Electric Power Systems, Wiley. Gilbert M. Masters, (2004): Renewable and Efficient Electric Power Systems, Wiley Interscience, Stanford University. Brendan Fox, Damien F. Leslie B. Nick J. David M. Richard W. and Olimpo A. (2007): Wind power integration: connection and system operational aspects, IET. M. Shahidehpour, Hatim Yamin, Zuyi Li (2002): Market operations in electric power systems: forecasting, scheduling, and Risk Management, Wiley Interscience. Remus Teodorescu,Marco Liserre,Pedro Rodríguez,Frede Blaabjerg (2011): Grid Converters for Photovoltaic and Wind Power Systems, Wiley

Modul 40: Rational Use of Energy and Energy Auditing

Studiengang / course:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbezeichnung / module name:	Rational Use of Energy and Energy Auditing
ggf. Kürzel / abbreviation	RUE
ggf. Untertitel / subtitle	
ggf. Lehrveranstaltungen / seminar:	- Rational Use of Energy and Energy Auditing - Project Exercise: Energy Audit
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:	EEM developing countries: core elective
Lehrform / SWS / form of seminar / teaching hours per week:	- Rational Use of Energy and Energy Auditing: 3 SWH, seminar, max. 24 students/group - Project Exercise: Energy Audit: 1 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 students design and carry out an energy audit in a small to medium size public building in Flensburg. 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 (usually lighting, appliances and heating). The exercise results in an energy audit report, which has to be presented by the students.

Arbeitsaufwand / student workload:	- Rational Use of Energy and Energy Auditing: 45 contact hours, 30 hours self study Project Exercise: 15 contact hours, 60 hours self study
Kreditpunkte / credit points:	5
Voraussetzungen nach Prüfungsordnung/ preconditions according to examination regulations:	
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 facilties: structure and management targets - Energy indexes as a basis for energy accounting - Methodologies of Energy Auditing - Energy auditing: Initial data acquisition, energy indexes, energy balance, energy efficiency measures

	• Technical aspects - Lighting - Properties of Light: Colour temperature, Colour rendering, Brightness - Design of lighting systems: Intensity, Luminous Flux, Illuminance, Light Distribution, Point to Point Method, Lumen Method, Computertools for Light Design - Daylight - Lamps: Efficacy, Colour Rendering and Colour Temperature - Light Control - Electrical Appliances in Households and Offices - Electrical motors - Heating, Ventilation and Air Conditioning - Energy consumption for HVAC globally and in selected countries - Water Heaters and Hot Water Distribution - Room Comfort: Temperature, humidity and air quality - Heat Balance of a building: Heat gains, transmission and ventilation losses - Heating and cooling degree hours - Heating and Air Conditioning Systems - Computation of Heating and cooling demand • Practical Exercise: Energy Audit in a small or medium size building - Planning an Energy Audit - Conducting an Energy Audit - Writing up Energy Audit Report - Presenting Results
Studien- Prüfungsleistungen / form of examination:	The students carry out an energy audit and elaborate an audit report as a team. The individual grades are based on the quantity and quality of the individual contribution of each student (60%) and the overall quality of the report as a teamwork (40%).
Medienformen / media used:	Media • Power point presentation, Flip chart, Pin board, cards,transparencies, Notebooks/calculation software, Measuring Instrument for energy audit, • Handouts, e-books, exercises, weblinks available on BSCW-server
Literatur / literature:	Doty, Steve (2008): Commercial Energy Auditing Reference Handbook Thumann, P.E. (2008): Handbook of Energy Audits, 8th edition, Crc Pr Inc Krarti, Moncef (2010): Energy Audit of Building Systems: An Engineering Approach, 2nd edition, CRC Press

	Abbi, Y. P. ; Jain, Shashank (2006): Handbook on energy audit and environment management, New Delhi : The Energy and Resources Institute Väisänen, Heikki et al (no year): Guidebook for Energy Audit Programme Developers, SAVE-project AUDIT II Pita, Edward G. (2002): Air Conditioning –Principles and Systems, Prentice Hall (A more specific bibliography on the different aspects of energy auditing will be distributed at the begin of the seminar)

Modul 41: Project Management (PME) in International Development Cooperation

Studiengang:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbe-zeichnung:	Project Management in International Development Cooperation, PME (compulsory)
Kürzel	PME
ggf. Untertitel	---
Lehrveran-staltungen:	Module 1: Project Management (PME)
Semester:	This module is offered annually (summer term)
Modulverant wortliche(r):	Dorsi Germann
Dozent(in):	
Sprache:	English
Zuordnung zum Curriculum	This is the basic and compulsory module in the economic and social science sector of the developing countries' stream of the EUM Master's Course. It is directly linked to Organizational Behaviour (Module: Diversity Management)
Lehrform / SWS/ Gruppengröß e:	This module is conducted as seminar taking 4 semester week hours for up to 25 participants each. Teaching and learning methods use inputs from visualised lectures and moderated working sessions on the various topics based on the relevant literature and internet sources. There are practical, individual, pair and group exercises; analysis, comparison and drafting of case studies; interactive internet use, role plays and development of scenarios. The exchange of intercultural experience of the students from all over the world in exemplary project planning steps and management skills contributes to the synergetic outputs of the seminars.
Arbeits-aufwand:	Within this module students study an additional 90h on their own besides the 60h they attend the seminar. Project Management 150h: Contact hours: 4h x 15w =60h Self study: 90h
Kreditpunkte:	The module has 5 Credit Points (4 SWS)
Voraussetzun gen:	This module gives basic knowledge in planning, monitoring and evaluation of projects or programs in the field of international development cooperation
Lernziele/ Kompetenzen	Overall goal: Students have acquired knowledge, skills and attitudes to engage themselves actively in the participatory identification, planning and implementation management of projects/programs in international development cooperation and in institutions of their home country. At the end of this module students have developed competencies in - planning, monitoring and evaluation - subject matters and methods; - analysis, reflection and assessment; - ethical behaviour, taking over responsibilities and self development.
Inhalt:	This module focuses on theories and concepts, models and practical applications of project planning and management in international development cooperation, considering the context, needs, interests and priorities of the various stakeholders (beneficiaries, donors, implementers) of development projects or programs. Emphasis is put on a participatory approach to identify and plan projects/programs based on scientific research techniques.
Studien-	Assessment of students participation, performance, study of relevant literature

Prüfungs-leistungen:	and internet sites is tested through • a visualised and interactive presentation (30 min) and facilitation of an exercise based on individual or group work preparation, • elaboration on the presented topic in a written paper (15 pages).
Medien-formen:	In this module a wide spectrum of media is used, such as books and planning documents, laptops/internet and beamer for power point presentation, OHP transparencies, flip chart, posters, workshop cards, markers, black board, BSCW server.
Literatur:	Besides this basic literature available in the university library, a more elaborated list and updated internet links are distributed together with a glossary, prior to the seminar, for example. • Chambers, R. (1997): "Whose Reality counts?" Putting the last first." Intermediate Technology Publication, London • Haines, Stephen G. (2000): The Systems Thinking Approach to Strategic Planning and Management, Library of Congress, USA • Neuman, W.Lawrence (2000): Social Research Methods. Qualitative and Quantitative Approaches. Allyn and Bacon, Toronto, Singapore • Lewis, J.P. (2011): Project Planning, Scheduling and Control. The ultimate Hands-on Guide to Bringing Projects in on Time and on Budget. McGraw Hill, New York, Toronto, US • Miller, Delbert C. / Salkind, Neil J. (2002): Handbook of Research Design and Social Measurement. Sage Publication, UK/India • Verzuh,E. (2000): The fast forward MBA in Project Management. Quick Tips, Speedy Solutions, Cutting-edge Ideas, Wiley and Sons, New York, Toronto, US

Modul 42: Diversity Management

Studiengang:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbe-zeichnung:	Diversity Management in International Development Cooperation (compulsory)
Kürzel	
ggf. Untertitel	---
Lehrveran-staltungen:	Organizational Behaviour
Semester:	This module is conducted in the second semester.
Modulverant wortliche(r):	Dorsi Germann John Kuteesakwe
Dozent(in):	
Sprache:	English
Zuordnung zum Curriculum	This is the basic and compulsory module in the economic and social science sector of the developing countries' stream of the EUM Master's Course.
Lehrform / SWS/ Gruppengröß e:	This module is conducted as a seminar taking 4 semester week hours for up to 25 participants each. Teaching and learning methods use inputs from visualised lectures and moderated working sessions on the various topics based on the relevant literature and internet sources. There are practical, individual, pair and group exercises; analysis, comparison and drafting of case studies; interactive internet use, role plays and development of scenarios. The exchange of intercultural experience of the students from all over the world in exemplary project planning steps and management skills contributes to the synergetic outputs of the seminars.
Arbeits-aufwand:	Module 2: Organizational Behaviour 150h: Contact hours: 4h x 15w =60h Self study: 90h
Kreditpunkte:	The module has 5 Credit Points (4 SWS)
Voraussetzun gen:	This module gives basic knowledge in managing people in international organizations
Lernziele/ Kompetenzen	Overall goal: Students have acquired knowledge, skills and attitudes to manage people in organizations (team building, human resource management, motivation, leadership etc.) Studying this module, students are able to handle people in organizations and to work in a team project for the international classroom. At the end of this module students have developed competencies in - subject matters and methods; - handling processes and people; - analysis, reflection and assessment; - negotiation, conflict and problem solving; - presentation and facilitation; - self- and project organisation; - interdisciplinary communication, team work and socio-cultural interaction; - ethical behaviour, taking over responsibilities and self development.
Inhalt:	This module focuses on theories and concepts, models and practical

	applications of project planning and management in international development cooperation, considering the context, needs, interests and priorities of the various stakeholders (beneficiaries, donors, implementers) of development projects or programs.
Studien-Prüfungs-leistungen:	Assessment of students participation, performance, study of relevant literature and internet sites is tested through • a visualised and interactive presentation (30 min) and facilitation of an exercise based on individual or group work preparation, • elaboration on the presented topic in a written paper (15 pages).
Medien-formen:	In this module a wide spectrum of media is used, such as books and planning documents, laptops/internet and beamer for power point presentation, OHP transparencies, flip chart, posters, workshop cards, markers, black board, BSCW server.
Literatur:	Besides this basic literature available in the university library, a more elaborated list and updated internet links are distributed together with a glossary, prior to the seminar. Reference is made to organisations in international development cooperation which have guidelines and handbooks on project and program management. Francesco, Anne Marie (2004 2nd ed.) International Organizational Behaviour, Prentice Hall, New Jersey/USA Robbins, S.P. / Decenzo, D.A. (3rd ed. 2001): Fundamentals of Management – Essential concepts and applications. Prentice Hall, New Jersey/USA Robbins, St./Coulter, M. (2001) : Management, Prentice Hall, New Jersey, US Robbins, St. (2001) Organizational Behavior, Prentice Hall,, New Jersey, US Stockdale, M/ Crosby, F. (eds) (2005): The Psychology and Management of Workplace Diversity. Blackwell, Victoria, Australia Warner, Malcolm and Joynt, Pat (2nd ed. 2004): Managing Across Cultures

Modul 43: Sustainable Energy Innovation/Implementation in Developing Countries

Studiengang:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbezeichnung:	Sustainable Energy Innovation/Implementation in Developing Countries
ggf. Kürzel	
ggf. Untertitel	
ggf. Lehrveranstaltungen:	
Semester:	The module takes place in the second semester and is offered once in a year.
Modulverantwortliche(r):	Prof. Dr. August Schläpfer
Dozent(in):	Prof. Dr. August Schläpfer
Sprache:	English
Zuordnung zum Curriculum	M.Eng. SESAM, 2. Semester, Compulsory Module
Lehrform / SWS:	4 SWH seminar, max. 24 students/group The seminar consists of inputs through lectures and moderated working sessions. The students have to prepare small presentations on selected topics. These can be done in small groups or individually, depending on the topic. A fine-tuning of the seminar contents will take place at the beginning of the seminar in order to incorporate the knowledge and experience of students who dispose of professional experience in the fields concerned.
Arbeitsaufwand:	Attendance: approx. 60 hours Self-study/Group wok: approx. 90 hours
Kreditpunkte:	5
Voraussetzungen:	
Lernziele / Kompetenzen:	The overall goal of the module is to give students an illustration/interpretation of policy frameworks and systems of innovation that are essential to the implementation of sustainable energy technologies in developing countries. They will be able to assess and contrast the impact of local and national systems of innovation on technology change and implementation, and they will be able to appraise the importance of entrepreneurship in technology transfer and capacity building in the energy sector. Specific objectives

	The students will be able to - discuss the current methods of energy provision in developing countries - demonstrate how energy policy is transformed from ideas to reality through the decision making, approvals and administrative processes - identify key elements that affect the successful introduction of renewable technologies in a development setting including needs assessment, technology transfer, capacity building, financing and gender issues - analyse energy policy for its effectiveness to accelerate deployment and access to sustainable energy in developing countries - assess the role of entrepreneurship in energy projects - differentiate between national and local systems of innovation in relation to energy provision - outline the costs and challenges of integrating increasing shares of renewable energy into energy supply systems in developing countries - describe how energy policy ideals may become compromised through the political processes involved
Inhalt:	This module identifies and appraises the linkages between renewable energy innovation and dissemination, such as the co-benefits and co-costs, mitigation potential, to achieve sustainable development in developing countries. It evaluates policy options, outcomes and conditions for their effectiveness, as well as constraints for integration into the energy supply system. The module analysis how accelerated deployment of renewable energy technologies could be achieved in developing countries in a sustainable manner. The mitigation potential and costs of renewable energy technologies are assessed and the role of entrepreneurship in the process of innovation of energy technologies is assessed. In addition the module deals with the processes and institutions that give rise to the shape, direction, and outcomes in the energy sector. Contents • Sustainable energy and development • Entrepreneurship in energy projects • Local versus national innovation systems • Policy framework • Institutional arrangements • Finance mechanisms • Assessment of renewable energy technologies and related policy and financial instruments

	• Capacity building • Evaluate the potential of renewable energy for the mitigation of climate change • Technology transfer • Assessment of the appropriateness of the range of energy technologies applicable to a developing country (social/cultural, practical, economic and environmental) • Community engagement • Renewable energy and sustainability • Gender issues • Barriers and drivers
Studien- Prüfungsleistungen:	Presentation (30 min) and written paper (approx. 15 pages) Alternatively, if too many students attend the course, the presentation can be replaced by a more extensive written paper (approx. 30 pages)
Medienformen:	Media • Power point presentation, Flip chart, Pin board, cards,transparencies, Notebooks/Planning tools • Handouts, e-books, exercises and weblinks are available on BSCW-server
Literatur:	- IPCC (2011) Special Report Renewable Energy Sources (SRREN) - Schumpeter, J. (1934) The Theory of Economic Development, Harvard, New York - Lundvall, B.Ä. (2010) National Systems of Innovation – Towards a Theory of Innovation and Interactive Learning, Anthem Press, UK - Aubert, J-E (2004) Promoting Innovation Developing Countries : A Conceptual Framework, The World Bank, on line, available: http://siteresources.worldbank.org/KFDLP/Resources/0-3097AubertPaper%5B1%5D.pdf - Suthersane, U. (2006) Utility Models and Innovation in Developing Countries, UNCTAD-ICTSD Project on IPRs and Sustainable Development, on line, available: http://www.unctad.org/en/docs/iteipc20066_en.pdf - Shane, S. (2003) A General Theory of Entrepreneurship – The Individual Opportunity Nexus, Edward Elgar Publishing Limited, UK - Martinot, E. et al (2002) Renewable Energy Markets in Developing Countries, Annu. Rev. Energy Environ. 2002. 27:309–48

Modul 44: Development Strategies and Organizations in International Development Cooperation

Studiengang:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbe-zeichnung:	Development Strategies & Organisations in International Development Cooperation (optional)
Kürzel	DESOID
ggf. Untertitel	---
Lehrveran-staltungen:	Course 1: Development Strategies Course 2: Organisations in International Development Cooperation
Semester:	Both courses of this module are offered annually in the first semester (summer term)
Modulverant-wortliche(r):	Prof. Dr. August Schläpfer
Dozent(in):	Course 1: Prof. Dr. August Schläpfer Course 2: Prof. Dr. August Schläpfer
Sprache:	English
Zuordnung zum Curriculum	This optional (core elective) module is directly linked to the module Project Planning and Management). It is also recommended to all those students with little knowledge and experience in International Organisations and Development Policy and Strategies. It assists the modules in the technical sector in so far as it provides the organisational framework and historical context of energy and environmental development and policy. Furthermore, the many internet links studied can help to make contacts with relevant organisations, when preparing for the project of the International classroom as well as for the Master's theses research.
Lehrform / SWS: Gruppengröße	Both courses of this module are conducted as seminars, taking 2 semester hours for up to 25 participants each. In both seminars teaching and learning methods use inputs from visualised lectures and moderated working sessions on various topics, based on the relevant literature and internet sources. There are practical individual, pair and group exercises, based on analysis, comparison and drafting of case studies, interactive internet use, and development of scenarios.
Arbeits-aufwand:	In both courses within this module students study an additional 45h on their own besides the 30h they attend the seminars. Course 1: Development Strategies 75h: Contact hours: 2hx15w =30h Self study: 45h Course 2: International Organisations 75h: Contact hours: 2hx15w =30h Self study: 45h
Kreditpunkte:	The module has 5 Credit Points equally distributed on the 2 courses: Course 1: Development Strategies 2,5 CP (2 SWS) Course 2: International Organisations 2,5 Cp (2 SWS)
Voraussetzungen:	There are no formal preconditions for the participation in this module. The courses are recommended, however to those students who do not have much knowledge in and experience with international organisations in

	development cooperation and/or development strategies to assist the work done in the module on Project Planning and Management.
Lernziele / Kompetenzen:	Overall: From this module students gain knowledge, skills and attitudes which enables them to compare, assess and relate development policies/strategies, and to collaborate actively with organisations in international development cooperation. Course 1: Development Strategies In this seminar students get subject matter knowledge on the decades of development strategies within their historical, cultural and socio-economic context. They develop competencies in critical reflection, comparison and assessment of political and economic concepts of development as well as the ability to handle interdisciplinary processes in intercultural team work. Course 2: Organisations in International Development Cooperation This seminar enables the students to critically assess international development organisations, as well as actively collaborate with and use the services of selected organisations in international development cooperation. They develop economic, political and international competencies and methodological skills, as well as the ability to analyse, communicate and work in intercultural teams.
Inhalt:	General: The module gives an overview on the interdependent socio-cultural, political, technical and economic change of societies and the relevant theories, models, strategies and organisations of international development cooperation towards sustainable development in a globalized world. Course 1: Development Strategies includes the study of the impact of under and over development in its historical context of industrialised nations as well as developing countries. Concepts of development aid and sustainable development are critically considered as well as measurement of development (Human Development Index) and the impact of development assistance in the framework of the Millennium Development Goals (MDG). The decades of development strategies are analysed with a focus on energy development. Course 2: The various interpretations and concepts, strategies and indicators of development are reflected in the profiles of bilateral and multilateral organisations of international development cooperation (e.g. World Bank, Regional Development Banks, selected UN-organisations, European Commission, OECD etc.). They are introduced, elaborating on their major structures, policies, objectives, funding, working areas, procedures and services of their projects and programs. Selected concepts and cross section topics of various organisations are analysed and compared, and procedures are shown on how to collaborate actively with them.
Studien-Prüfungsleistungen:	Assessment of students participation, performance, study of relevant literature and internet sites is tested through • A visualised and interactive presentation (30 min) and facilitation of an exercise based on individual or group work preparation and a written report (15 pages). Both parts count 50% each of the final mark. Alternatively it is possible to do the presentation or report as a written assignment (home work) and a written test/examination (2 hours).
Medienformen:	In both courses of this module a wide spectrum of media are used, such as books, readers and sample documents, laptops/internet and beamer for power point presentation, OHP transparencies, flip chart, posters, workshop cards, markers, black board, BSCW server.

Literatur:	Besides this basic literature available in the university library, a more elaborated list and updated internet links are distributed together with a glossary prior to the seminars. All organisations in international development cooperation have internet websites. Course 1: Development Strategies Ha-Joon Chang (2007): Bad Samaritans – Rich Nations, Poor Policies and the Threat to the Developing World, Random House Business Books, LondonCavanagh, John (2002): Alternatives to Economic Globalization, Berrett-Koehler/San Francisco/USA Rapley, John (2002): Understanding Development: Theory and Practice in the Third World, Lynne Rienner Publishers, Boulder/USA United Nations (2003): World Development Report 2003. Sustainable Development in Dynamic World, New York/USA World Bank (1999): Assessing Aid: What Works, What Doesn't, and Why, Washington/USA Course 2: Organisations in International Development Cooperation BMZ (2000) Partners for the Future – German Development Policy in the 21st century, Berlin www.bmz.de EC (2002) The European Development Fund in a Few Words, Brussels www.europa.eu.int/comm/development Secr. of State for Internat. Development (2000) Eliminating World Poverty: Making Globalisation Work for the Poor (White Paper on International Development), London www.globalisation.gov.uk UNDP (2005) Human Development Report, New York www.undp.org World Bank World Development Reports, Washington www.worldbank.org - Attacking Poverty (2003) - Making Services Work for Poor People (2004)

Modul 45: International Class

Studiengang / course:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbezeichnung / module name:	International Class
ggf. Kürzel / abbreviation	IC
ggf. Untertitel / subtitle	
ggf. Lehrveranstaltungen / seminar:	
Semester / semester:	The module is offered once a year. The preparation seminar takes place during the second semester, the International Class takes place in the semester break at the end of the second semester.
Modulverantwortliche(r) / person in charge of module:	Dipl.-Ing. Wulf Boie
Dozent(in) / person teaching the seminar:	Dipl.-Ing. Wulf Boie / Prof. August Schläpfer
Sprache / language:	English
Zuordnung zum Curriculum / attribution to courses:	EEM developing countries: compulsory
Lehrform / SWS / form of seminar / teaching hours per week:	Preparation seminar: 2 teaching hours/week Project: 90 teaching hours (five week block) The module is organised as a project seminar and follows the steps of the project learning approach. Methodological details are described under "contents".
Arbeitsaufwand / student workload:	Preparation seminar Attendance: 30 hours Individual work: 90 hours Project Guided Project Work: 180 hours
Kreditpunkte / credit points:	10
Voraussetzungen nach Prüfungsordnung/ preconditions according to examination regulations:	Successful completion of all required compulsory and mandatory elective modules
Modulziele / angestrebte Lernergebnisse / aims of the module / aspired learning outcome:	The overall goal of the module is to enable the students to plan, prepare and carry out a comprehensive field study in a multi disciplinary and multicultural team Specific Objectives The students

	- are able to define and narrow down a comprehensive research problem to specific research questions - are able to select and apply the appropriate methods of social and technical research in the energy sector - are able to design and monitor an activity and time planning - have improved their project organisation skills - have improved their capability to think multidisciplinary - have improved their capability to work in intercultural and multidisciplinary teams under time pressure - have improved their problem solving and conflict resolution skills - have developed the attitudes and communicative skills to work in an unfamiliar environment - are able to write up and present a research report in a team - are able to apply and combine the knowledge learned during the course of studies
Inhalt / subjects covered:	The International Class provides the opportunity to apply and combine the knowledge and competencies, gained so far during the course of studies, in a real life situation. It is organised in close co-operation with partner organisations abroad. While the preparation class is organised at the university, the practical exercise takes place abroad, preferably in a rural community development situation. The module follows the typical phases of the project based learning approach. The first two steps take place in the preparation seminar during the winter term: 1. Defining the project: The framework and scope of the project is outlined by the partner organisation in co-operation with the University of Flensburg. The project has then to be defined more in detail and narrowed down by the students during the preparation class. 2. Preparing the project: During the preparation class the students have to obtain first information about the project site and the research topic. They develop a research plan, select appropriate methodologies and work out research instruments. The project exercise itself is carried out abroad: 3. Accomplishment: The students travel to the project site abroad. After a first introduction by the partner organisations the students split into smaller groups (if the students group comprises more than 12 students), which are accompanied by a lecturer. They improve and finalise their planning and the research instruments and thereafter collect information at their research sites, applying different social and technical research methods. This phase

	usually takes two weeks. Within another two weeks the students have to analyse the information, draw conclusion, elaborate suggestions and write up a report. 4. Presentation and Evaluation: Within a public meeting the report is presented and handed over to the communities and the partner organisation. For the students the discussion with the public and the partners after the presentation constitutes a first evaluation of their work. During the past nine years the International class has been carried out in Scotland in co-operation with the Highland and Island Enterprise
Studien- Prüfungsleistungen / form of examination:	Each student has to do one individual presentation during the preparation seminar (preparatory paper). The preparatory paper may be elaborated by teams of two students. In this case the chapter of the paper have to be assigned to individuals. During the project exercise the students elaborate and present a final report (project report) as a team with assigned and quantified individual contributions. The individual grades are based on the quantity and quality of the individual contribution of each student (60%) and the overall quality of the report and presentation as a teamwork (40%). The final individual grade is made up of the grade for the preparatory paper (40 %) and the grade for the project report (60%)
Medienformen / media used:	Media preparation seminar • Power point presentation, Flip chart, Pin board, cards • Handouts, e-books and weblinks available on BSCW-server project exercise • Power point presentations, Flip charts • Notebook, planning software depending on project • Measurement instruments depending on project
Literatur / literature:	As the topics of the International Classes change, specific bibliographies will be compiled for each International Class separately

Modul 46: Vorkurs/Preparatory Course in Energy Economics

Studiengang:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbezeichnung:	Vorkurs/Preparatory Course in Energy Economics
ggf. Kürzel:	
ggf. Untertitel:	Foundations of Energy Economics and Energy Management
ggf. Lehrveranstaltungen:	
Semester:	Before the 1st semester
Modulverantwortliche(r):	Prof. Dr. August Schläpfer
Dozent(in):	Prof. Dr. August Schläpfer
Sprache:	English
Zuordnung zum Curriculum:	M.Eng. Energie- und Umweltmanagement pre-course
Lehrform / SWS:	Seminar with max. 25 students
Arbeitsaufwand:	2 weeks block seminar
Kreditpunkte:	none
Voraussetzungen:	none
Lernziele / Kompetenzen:	The course wants to introduce the students to the field of Energy Economics and Energy Management as a qualification for the M.Eng. Energy and Environmental Management course. The main aims of the course are for the students to gain basic insights into the field of energy economics and energy markets, in the first instance, neo-classical economics. Second, the students will be introduced to natural resource economics and touch on the associated environmental economics. Lastly, the course discusses the limitations of the neo-classical economic model to deal with energy and the environment and provides a brief introduction into alternative economic models, such as ecological economics.
Inhalt:	The course will focus on an international perspective of energy production and use and discusses academic and political contents. The economics of energy production and use within the concept of sustainable development form a major part of this course. It touches on possible strategies and methodologies to a more sustainable energy future. The following topics will be covered: • Introduction to energy markets • Coal, oil and gas and electricity markets • Introduction to Resource Economics • Introduction to Ecological/Biophysical Economics • Energy risks • Energy security • Energy and sustainable development

	• Role of government in energy economics • Concepts of sustainability • Law of entropy and energy • Energy and climate change
Studien-Prüfungsleistungen:	Written examination
Literatur:	• Tietenberg, T. and Lewis, L. (2009) Environmental and Natural Resource Economics, Pearson International Edition, Eighth Edition, Pearson Addison Wesley, Boston, ISBN 13: 978-0-321-56046-9 • Dahl, C. A. (2004) International Energy Markets: Understanding Pricing, Policies, and Profits, Penn Well Corporation, USA, ISBN: 978-0-87814-799-1 • Deutscher, G. (2008) The Entropy Crisis, World Scientific Publishing Co. Pty. Ltd. Singapore, ISBN: 13 978-981-277-968-7

Modul 47: Vorkurs/Preparatory Course in Business Administration

Studiengang:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbezeichnung:	Vorkurs/Preparatory Course in Business Administration Course
ggf. Kürzel:	BAC
ggf. Untertitel:	Management of Small and Medium Sized Enterprises
ggf. Lehrveranstaltungen:	
Semester:	Before the 1st semester
Modulverantwortliche(r):	Prof. Dr. August Schläpfer
Dozent(in):	Dr. Britta Boyd
Sprache:	English
Zuordnung zum Curriculum:	M. Eng. Energie- und Umweltmanagement pre-course
Lehrform / SWS:	Seminar with max. 25 students
Arbeitsaufwand:	2 weeks block seminar
Kreditpunkte:	none
Voraussetzungen:	none
Lernziele / Kompetenzen:	The course wants to introduce the students to the field of "Business Administration" as a qualification for the M.Eng. Energie- und Umweltmanagement course.
Inhalt:	The course wants to introduce the students to the field of "Business Administration" • Main subjects of organization, production, marketing, finances and strategic planning • All functions are viewed from the perspective of small and medium sized enterprises, where entrepreneurship will also be discussed
Studien-Prüfungsleistungen:	Written examination
Literatur:	Hodgetts/Kuratko (1998) Effective Small Business Management. Dryden Press. Robbins/Coulter (2003) Management, Prentice Hall. Innovation and Entrepreneurship John Bessant, Imperial College Joe Tidd, University of Sussex ISBN: 978-0-470-03269-5. Barringer/Ireland (2010) Entrepreneurship, Pearson. Nielsen/Klyver/Evald/Bager (2009) Entrepreneurship in Theory and Practice, IDEA, Kolding, DK.

Modul 48: Vorkurs/Preparatory Course in Economics

Studiengang:	M. Eng. Energie- und Umweltmanagement / M. Eng. Energy and Environmental Management
Modulbezeichnung:	Vorkurs/Preparatory Course in Economics
ggf. Kürzel:	
ggf. Untertitel:	Basics in Micro- and Macroeconomics / Preperatory course
ggf. Lehrveranstaltungen:	
Semester:	Before the 1st semester
Modulverantwortliche(r):	Prof. Dr. August Schläpfer
Dozent(in):	Prof. Dr. Roland Menges
Sprache:	English
Zuordnung zum Curriculum:	M. Eng. Energie- und Umweltmanagement pre-course
Lehrform / SWS:	Seminar with max. 25 students
Arbeitsaufwand:	2 weeks block seminar
Kreditpunkte:	none
Voraussetzungen:	none
Lernziele / Kompetenzen:	The main objective of the course is to develop a comprehensive introduction to the world of economic thinking as a pre-requisite for a deeper investigation of problems of energy- and environmental management. Pinciples of economics are introduced and discussed within the context of sweeping developments concerning economic growth, the functioning of markets, market intervention, employment and global commerce.
Inhalt:	According to the basic economic literature this course includes the main subjects of micro and macro economics. The course will focus on an international perspective and discusses academic and political contents.
Studien-Prüfungsleistungen:	Written examination
Literatur:	• Blanchard (2003) Macroeconomics, Prentice Hall. • Parkin (2008) Economics – seventh edition, Pearson Education. • Pindyck/Rubinfeld (2005) Microeconomics, Pearson Education.

Modul 49: Vorkurs/Preparatory Course in Statistics

Studiengang / course:	M. Eng. Energie- und Umweltmanagement
Modulbezeichnung / module name:	Vorkurs/Preparatory Course in Statistics
ggf. Kürzel / abbreveation	Statistics
ggf. Untertitel / subtitle	
ggf. Lehrveranstaltungen / seminar:	
Semester / semester:	Before first semester
Modulverantwortliche(r) / person in charge of module:	MSc. William Tarazona
Dozent(in) / person teaching the seminar:	MSc. William Tarazona
Sprache / language:	English
Zuordnung zum Curriculum / attribution to courses:	EEM developing countries: Preparatory course for students without knowledge in statistics
Lehrform / SWS / form of seminar / teaching hours per week:	1 week seminar with exercises 30 contact hours
Arbeitsaufwand / student workload:	30 contact hours 10 hours individual work
Kreditpunkte / credit points:	none
Voraussetzungen nach Prüfungsordnung/ preconditions according to examination regulations:	
Modulziele / angestrebte Lernergebnisse / aims of the module / aspired learning outcome:	The students - acquire knowledge to decide appropriate statistics techniques to be applied depending on the type of problem that needs to be solved - are able to, given a sample, describe all relevant aspects of said sample related with the problem at hand - are able to, given a sample, infer information about the population from where the sample came from - are able to solve statistics problems with the use of computers, using special statistics software such as SPSS and utility software like Excel. - are able to write small syntax programs to automatize repetitive work - are able to manipulate existent information in order to create new relevant (to an analysis) information
Inhalt / subjects covered:	Descriptive Statistics - Important concepts: Population, Sample, Variable, Scales, Interviews, Distribution forms, Standardized values, Outliers - Distribution Tables: Absolute, relative and cumulative distributions - Central tendency measures: Mode, Median and mean

	- Dispersion measures: Range, Variance, Standard deviation, Quartiles, Correlation coefficient - Graphical representation: Bar diagrams, Histograms, Stem and leaf Diagrams, Box plots, Scatter plots, etc. - Relationships between two or more variables: Cross tables, regression analysis Inference Statistics: - Important concepts: Confidence Intervals, Tests, significance, Distribution: Normal distribution, Chi-Square, T, F, Independent and dependent samples. - Tests: T-Test, Independent Test, Anova SPSS: - Introduction to SPSS - Data manipulation: Recoding, Computing, Selection, Index Construction.
Studien- Prüfungsleistungen / form of examination:	Written test
Medienformen / media used:	Power point presentations, Computer
Literatur / literature:	Anderson, David et al: (2005): Statistics for Business and economics, South-Western Educational Publishing - McClave,James et al (2004): Statistics for Business and econonomics, 9th edition, Prentice Hall - Green, Samuel B.(2000): Using SPSS for Windows : analyzing and understanding data, N.J. Prentice Hall