

<b>English for Engineers (ENFE)</b>				
<b>Code</b>	<b>Workload</b>	<b>ECTS</b>	<b>Frequency</b>	<b>Duration</b>
Study Semester Renewable Resources	90 h	3 ECTS	Summer semester (March to July)	1 semester
1	<b>Course</b> -Lectures -Workshops	<b>Contact hours</b> 40 h	<b>Selfstudy</b> 50 h	
2	<b>Learning outcomes / competencies</b> Upon completion of the module, students will <ul style="list-style-type: none"> <li>• get acquainted with vocabulary deriving from ecology, energy industry, materials, engineering, marketing and economy, agroindustry, climate change, law.</li> <li>• be trained in verbal structures required for descriptions, debating, reasoning portraying, logical linkage, presentations.</li> <li>• have acquired know-how, vocabulary as well as structures by means of English articles for subsequent comments, reproduction or assessment.</li> <li>• have been encouraged to use the English language accurately.</li> </ul>			
3	<b>Content</b> <ul style="list-style-type: none"> <li>• Vocabulary from the fields mentioned above studying scientific articles and further Anglosaxon sources.</li> <li>• Confident written and oral performance owing to workshops: academic writing, presenting, conversation</li> <li>• Idiomatic usage</li> <li>• Linguistic correctness – workshop: English Refresher</li> <li>• Communications training – language is a tool</li> </ul>			
4	<b>Teaching and Didactics</b> Tutorial-style language training including lecture phases, workshops, oral comments, presentations, papers			
5	<b>Prerequisites</b> Fluent English recommended (writing and orally, B2/C1)			
6	<b>Exam</b> Presentation with discussion			
7	<b>Condition to award ECTS</b> Presence 30 h, preparation plus follow-up chores as well as exam prep 60 h			

8	<b>Recognition of Module in other study program</b> According to study plans
9	<b>Weighing factor of exam</b> 1.0
10	<b>Lecturers</b> <ul style="list-style-type: none"> <li>• Mag. phil. Birgit Hoess</li> </ul>
11	<b>Other information:</b> Language: English  <b>Literature:</b> Brieger, Nick, Alision Pohl: Technical English. Vocabulary and Grammar, Summertown, Oxford, 2002 Latest scientifically relevant papers taken from Nature, The Guardian, The Independent, The New York Times, Scientific American), BBC documentaries , among others

<b>Sustainable Business Administration and Simulation (SBAS)</b>				
<b>Code</b>	<b>Workload</b>	<b>ECTS</b>	<b>Frequency</b>	<b>Duration</b>
Study Semester	90 h	6 ECTS	Summer semester	1 semester
Renewable				
Resources				
1	<b>Course</b> - Lectures - Business Simulation - Group work	<b>Contact hours</b> 60 h	<b>Selfstudy</b> 30 h	
2	<b>Learning outcomes / competencies</b> Upon completion of the module, students will <ul style="list-style-type: none"> <li>• provide basics in economics with focus on sustainability as well as on entrepreneurial thinking.</li> <li>• are able to evaluate business data and to adequately adopt, read and interpret financial management reports.</li> <li>• are able to recognize and consider internal and external conditions for business success in a dynamic competitive environment.</li> <li>• acquire presentation skills for results, strategies and analysis.</li> <li>• learn effective decision-making in a team including assessment of the implications of decision.</li> </ul>			

3	<p><b>Content</b></p> <p>This course is designed to introduce the students to the principles and functions of business with a focus on topics like ecology and sustainability as important part of the business environment.</p> <p>Within the module business will be studied as an important part of the total social, political and economic environment. The different areas of business will be covered and enhanced by application of an computer-based business simulation. Participants will represent the owners of up to five companies. They need to make strategic and operative decisions and try to lead their company successfully in an competitive environment.</p> <p>The course will be accompanied by relevant lectures providing basics in:</p> <ul style="list-style-type: none"> <li>• Business ownership</li> <li>• Financial information</li> <li>• Planning</li> <li>• Profit and loss account</li> <li>• Financial accounting</li> <li>• Financial reporting</li> <li>• Sustainability from an entrepreneur's point of view</li> </ul>
4	<p><b>Teaching and Didactics</b></p> <p>Lectures, exercises &amp; group work with computer-based business simulation (→ TOPSIM General Management including comments, presentations, papers)</p>
5	<p><b>Prerequisites</b></p> <p>With regard to content: Module „Marketing and sales“ recommended  Fluent English recommended (writing and orally, B2/C1)</p>
6	<p><b>Exam</b></p> <ul style="list-style-type: none"> <li>• Written exam (60 min) – 50 %</li> <li>• Presentation – 30 %</li> <li>• Outcome business simulation –20 %</li> </ul>
7	<p><b>Condition to award ECTS</b></p> <p>Presence, pass of exam, successful presentation and successful participation in business simulation</p>
8	<p><b>Recognition of Module in other study programs</b></p> <p>Relevant or necessary in all other study areas</p>

9	<b>Weighing factor of exam</b> Weighting according to allocated credit points (ECTS)
10	<b>Lecturers</b> <ul style="list-style-type: none"> <li>• Prof. Dr. Martin Pudlik</li> <li>• Prof. Dr.-Ing. Christian Reichert</li> </ul>
11	<b>Other information</b> <ul style="list-style-type: none"> <li>• Participation in business simulation requires equipment capable of online operation like laptop or tablet (alternative: participation via IT room at UAS Bingen)</li> </ul> <b>Literature</b> Participants' manual of the business simulation tool TOPSIM General Management  Other relevant material handed by the lecturers

<b>Sales and Marketing Aspects (SMA)</b>				
<b>Code</b>	<b>Workload</b>	<b>ECTS</b>	<b>Frequency</b>	<b>Duration</b>
Study Semester Renewable Resources	90 h	3 ECTS	Summer semester	1 semester
1	<b>Course</b> -Lectures -Exercises	<b>Contact hours</b> 30 h	<b>Selfstudy</b> 60 h	
2	<b>Learning outcomes / competencies</b> Upon completion of the module, students will <ul style="list-style-type: none"> <li>• be able to develop basic marketing and sales strategies for products in the area of "Renewable Resources".</li> <li>• have an enhanced comprehension of options for market development and market activities as well as market analysis, messaging and product portfolio adjustments.</li> <li>• have learned about the relevance of different models of international sales activities, composition of adequate sales channels, and sales supporting activities.</li> <li>• be able to apply the relevant tools which are shown, discussed and illustrated in the lecture by using concrete examples.</li> </ul>			

3	<p><b>Content</b></p> <ul style="list-style-type: none"> <li>• Analysis of the market and customer buying behaviour</li> <li>• Strategies for market development</li> <li>• Sensitising of markets</li> <li>• Marketing messages, media attention</li> <li>• Appropriate marketing mix</li> <li>• Live cycle of a product</li> <li>• Internationalisation of markets</li> <li>• Choice of international locations</li> <li>• Global account management</li> <li>• Composition and management of sales organisations</li> <li>• Sales channels</li> <li>• The internet as a sales channel</li> <li>• Cultural aspects and challenges in international markets</li> <li>• Business software/CRM supporting international sales activities</li> </ul>
4	<p><b>Teaching and Didactics</b></p> <p>Lectures (approx. 75%) and exercises (approx. 25%)</p>
5	<p><b>Prerequisites</b></p> <p>Good command of English</p>
6	<p><b>Exam</b></p> <p>Written exam</p>
7	<p><b>Condition to award ECTS</b></p> <p>Presence in the lectures</p>
8	<p><b>Recognition of Module in other study program</b></p> <p>According to study plans</p>
9	<p><b>Weighing factor of exam</b></p> <p>1.0</p>
10	<p><b>Lecturers</b></p> <ul style="list-style-type: none"> <li>• Prof. Dr. Stefan Gabriel</li> </ul>
11	<p><b>Other information:</b></p> <p>Language: English</p> <p><b>Literature:</b></p> <p>Lecture presentation slides and handouts  Kotler, Keller, Bliemel: "Marketing-Management"  Hollensen: "Marketing"</p>

<b>Climate Change and Environmental Impacts (CLIM)</b>				
<b>Code</b>	<b>Workload</b>	<b>ECTS</b>	<b>Frequency</b>	<b>Duration</b>
Study Semester Renewable Resources	90 h	3 ECTS	Summer semester	1 semester
1	<b>Course</b> -Lectures -Seminar	<b>Contact hours</b> 45 h	<b>Selfstudy</b> 45 h	
2	<b>Learning outcomes / competencies</b> Upon completion of the module, students will <ul style="list-style-type: none"> <li>• have gathered a basic understanding of the weather, climate and climate change.</li> <li>• understand the interaction between climate and land use/cover.</li> <li>• have learned about the impacts of climate and climate change on biodiversity.</li> <li>• have an enhanced comprehension of climate change mitigation and adaption.</li> <li>• obtain detailed knowledge of sustainable management instruments.</li> </ul>			
3	<b>Content</b> <ul style="list-style-type: none"> <li>• Climate characteristics and climate zones, natural and anthropogenic reasons for climate changes, SRES Scenarios and Climate scenarios, effects of individual climate</li> <li>• Characteristics and their combinations on terrestrial ecosystems (with focus on forest and agricultural ecosystems. Abiotic risks in forest and agricultural ecosystems. Possible feedbacks of land use changes on regional climate.</li> <li>• Impacts on Biodiversity: fossil and pollen records of past climate change, impacts of recent climate change on biodiversity: phenology, community composition, terrestrial and aquatic ecosystem processes, species extinction and immigration, adaptation principles, conservation management and case studies</li> </ul>			
4	<b>Teaching and Didactics</b> Lecture (60%), seminar (40%)			
5	<b>Prerequisites</b> None			
6	<b>Exam</b> Oral and written presentations			
7	<b>Condition to award ECTS</b> Presence and preparations			

8	<p><b>Recognition of Module in other study program</b></p> <p>According to study plans</p>
9	<p><b>Weighing factor of exam</b></p> <p>1.0</p>
10	<p><b>Lecturers</b></p> <ul style="list-style-type: none"> <li>• Prof. Dr. Elke Hietel</li> <li>• Prof. Dr. Panferov</li> </ul>
11	<p><b>Other information:</b></p> <p>Language: English</p> <p><b>Literature:</b></p> <p>Climate Change 2007 - The Physical Science Basis, Contribution of Working Group I to the Fourth Assessment Report of the IPCC, Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press</p> <p>Climate Change 2007 - Impacts, Adaptation and Vulnerability, Contribution of Working Group II to the Fourth Assessment Report of the IPCC , Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press</p> <p>Climate Change 2007 - Mitigation of Climate Change Contribution of Working Group III to the Fourth Assessment Report of the IPCC , Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press</p> <p>Lovejoy T.E., Hannah L.J. (eds.) (2005): Climate Change and Biodiversity. Yale University Press, New Haven &amp; London.</p>

<b>European Environmental Law and Politics (ELP)</b>				
<b>Code</b>	<b>Workload</b>	<b>ECTS</b>	<b>Frequency</b>	<b>Duration</b>
Study Semester Renewable Resources	90 h	4,5 ECTS	Summer semester	1 semester
1	<p><b>Course</b></p> <ul style="list-style-type: none"> <li>-Lectures</li> <li>-Seminar</li> <li>-Field trip</li> </ul>	<p><b>Contact hours</b></p> <p>39 h</p> <p>24 h (field trip)</p>	<p><b>Selfstudy</b></p> <p>27 h</p>	

2	<p><b>Learning outcomes / competencies</b></p> <p>Upon completion of the module, students will</p> <ul style="list-style-type: none"> <li>• have gathered a better understanding of the functioning of the European Union.</li> <li>• understand the interaction between national and European law and politics.</li> <li>• have an enhanced comprehension of the legal framework of European environmental politics and a more detailed knowledge of certain legal instruments.</li> <li>• have learned about the relevance of European case law.</li> <li>• be able to apply legal instruments in practical cases.</li> </ul>
3	<p><b>Content</b></p> <ul style="list-style-type: none"> <li>• Treaty of the European Union (TEU) and Treaty of the Functioning of the European Union (TFEU, former EC-Treaty)</li> <li>• Competences of the relevant institutions, decision</li> <li>• Decision making procedures</li> <li>• Principles of EU integration</li> <li>• Legal instruments</li> <li>• Rights of Citizens</li> <li>• Environmental law: legal impact on national legal orders, in depths analysis of waste law, air pollution law and energy law</li> <li>• Excursion to Brussels (visits of EU institutions and Environmental organizations)</li> </ul>
4	<p><b>Teaching and Didactics</b></p> <p>Seminar (30 %), individual preparation (30%), supervision in small groups or individually (10%) and field trip (30%)</p>
5	<p><b>Prerequisites</b></p> <p>None</p>
6	<p><b>Exam</b></p> <p>Practical training report, oral or written presentation</p>

7	<b>Condition to award ECTS</b> Pass of exam (consolidated with exam of Part A)
8	<b>Recognition of Module in other study program</b> Not applicable
9	<b>Weighing factor of exam</b> Weighting according to allocated credit points (ECTS)
10	<b>Lecturers</b> <ul style="list-style-type: none"> <li>• Prof. Dr. Roller</li> <li>• Prof. Hartmann</li> </ul>
11	<b>Other information:</b> Language: English  <b>Literature:</b> Text of the EU Treaties, text of EU Directives and Court decisions (www.eurlex.europa.eu)

<b>Air Resources (AIRE)</b>				
<b>Code</b>	<b>Workload</b>	<b>ECTS</b>	<b>Frequency</b>	<b>Duration</b>
Study Semester Renewable Resources	90 h	3 ECTS	Summer semester	1 semester
1	<b>Course</b> -Lectures -Practical training -Excursions	<b>Contact hours</b> 30 h	<b>Selfstudy</b> 60 h	
2	<b>Learning outcomes / competencies</b> Upon completion of the module, students will <ul style="list-style-type: none"> <li>• be able to characterize and appraise noxious pollutant loads.</li> <li>• be able to recognize pollutant sources carried out by exhaust gases, distinguish their climatic impact and apply technical processes to prevent emissions.</li> <li>• be able to appraise the necessity for the application of emission abatement measures.</li> </ul>			

3	<p><b>Content</b></p> <p>Emission and pollution of noxious compounds:</p> <ul style="list-style-type: none"> <li>• Fundamentals of laws and regulations</li> <li>• Pollutant dispersion and dispersion modeling</li> <li>• Atmospheric impacts by noxious gases</li> </ul> <p>Emission abatement:</p> <ul style="list-style-type: none"> <li>• Emission abatement processes</li> <li>• Exemplification by thermal waste treatment (Energy from waste)</li> </ul> <p>Practical training:</p> <ul style="list-style-type: none"> <li>• Test 1: Simulation of pollution dispersion at the computer</li> <li>• Test 2: Precipitation of SO<sub>2</sub> with a packed bed scrubber</li> </ul>
4	<p><b>Teaching and Didactics</b></p> <p>Lecturers, practical training (presence and homework), excursion</p>
5	<p><b>Prerequisites</b></p> <p>Fluent English recommended (writing and orally B2 or C1)</p>
6	<p><b>Exam</b></p> <p>Written examination</p>
7	<p><b>Condition to award ECTS</b></p> <p>Complete attestation of the reports of practical training, participation in the corresponding excursion (compulsory), passed written examination</p>
8	<p><b>Recognition of Module in other study program</b></p> <p>According to study plans</p>
9	<p><b>Weighing factor of exam</b></p> <p>1.0</p>
10	<p><b>Lecturers</b></p> <ul style="list-style-type: none"> <li>• N.N. (still not announced)</li> </ul>
11	<p><b>Other information:</b></p> <p>Language: English</p> <p><b>Literature:</b> Will be provided during the course</p>

<b>Sustainable Agriculture (SUAG)</b>				
<b>Code</b>	<b>Workload</b>	<b>ECTS</b>	<b>Frequency</b>	<b>Duration</b>
Study Semester Renewable Resources	90 h	3 ECTS	Summer semester	1 semester
1	<b>Course</b> -Lectures -Case studies (presentations) -Excursions	<b>Contact hours</b> 30 h	<b>Selfstudy</b> 60 h	
2	<b>Learning outcomes / competencies</b> Upon completion of the module, students will <ul style="list-style-type: none"> <li>• be conversant with criteria and issues related to sustainable agriculture in a globalizing world.</li> <li>• be able to identify relevant problems, collect and discuss relevant data and published information.</li> <li>• train to develop a conceptual framework and to suggest appropriate solutions on agriculture related problems regarding environmental, economic and social issues from a local, regional and global and interdisciplinary perspective.</li> <li>• be able to assess the potential of innovative technologies in the agricultural sector.</li> <li>• understand environmental and socio-economic problems due to the use of arable and non-arable land in particular, and integrate the purpose of resources protection into economic behaviour, animal resources and land use.</li> </ul>			
3	<b>Content</b>  The concept of sustainable agriculture under environmental, economic and social criteria in different farming systems <ul style="list-style-type: none"> <li>• Multi-functionality of agriculture</li> <li>• Challenge of food security</li> <li>• Sustainable plant and animal production systems</li> <li>• Conservation of plant and animal genetic resources</li> <li>• Agronomy, livestock production and climate change</li> <li>• Precision farming concepts and technology</li> </ul>			
4	<b>Teaching and Didactics</b>  Lectures, case studies, seminar (group and individual work with short presentations) and excursions to agricultural enterprises and international organizations			

5	<b>Prerequisites</b> Fluent English recommended (writing and orally, B2/C1)
6	<b>Exam</b> Report and presentation with discussion
7	<b>Condition to award ECTS</b> Pass of presentation and discussion
8	<b>Recognition of Module in other study program</b> According to study plans
9	<b>Weighing factor of exam</b> 1.0
10	<b>Lecturers</b> <ul style="list-style-type: none"> <li>• Prof. Dr. agr. Clemens Wollny (module responsibility)</li> <li>• Prof. Dr. Thomas Rademacher (precision farming)</li> </ul>
11	<b>Other information:</b>  Language: English  <b>Literature:</b>  Food and Agricultural Organization of the United Nations (FAO) 2016: The State of Food and Agriculture. Climate Change, Agriculture and Food Security. FAO, Rome <a href="http://www.fao.org/3/a-i6030e.pdf">http://www.fao.org/3/a-i6030e.pdf</a>  Malik, P.K. et al. (eds.) 2015: Livestock Production and Climate Change. CABI, Wallingford, UK and Boston, USA.

<b>Renewable Materials (REMA)</b>				
<b>Code</b>	<b>Workload</b>	<b>ECTS</b>	<b>Frequency</b>	<b>Duration</b>
Study Semester Renewable Resources	90 h	4,5 ECTS	Summer semester	1 semester
1	<b>Course</b> -Lectures -Seminar -Excursions	<b>Contact hours</b> 28 h presence 10 h field trip	<b>Selfstudy</b> 26 h personal work 26 h report	

2	<p><b>Learning outcomes / competencies</b></p> <p>Upon completion of the module, students will</p> <ul style="list-style-type: none"> <li>• distinguish renewable raw materials by their chemical nature, basic structures and resulting properties in processing and final use.</li> <li>• suggest potential application fields for the materials according to their material profile.</li> <li>• can judge about sustainability/ecological aspects of such materials by comparison with classical construction materials like metals and particularly petrochemical plastics.</li> <li>• know about availability, economic aspects of renewable materials and future chances.</li> <li>• be able to consider critically materials according to their profile and application.</li> <li>• be able to provide an integrated consideration of material, energetical and cascade use of materials in connection with climatic change and limited petrochemical resources.</li> <li>• be able to prepare biobased materials for measurement in the laboratory, can conduct measurements with the materials and relevant analytical instruments.</li> </ul>
3	<p><b>Content</b></p> <ul style="list-style-type: none"> <li>• Material use of renewable materials</li> <li>• Chemical families of renewable materials, structures, properties, availability</li> <li>• Processing and fields of application</li> <li>• Competitive materials, economical aspects of such materials</li> <li>• Environmental/ecological aspects of such materials</li> <li>• Material/energetical/cascade use</li> <li>• Potential future development</li> <li>• Connection with climatic change and limited resources</li> <li>• Practical course</li> </ul>

4	<b>Teaching and Didactics</b> Seminar, individual preparation, practical course in the laboratory, field trip
5	<b>Prerequisites</b> None
6	<b>Exam</b> Oral presentation, practical course with report, participation in field trip Presentation with discussion
7	<b>Condition to award ECTS</b> Pass of oral presentation and practical course, participation in field trip
8	<b>Recognition of Module in other study program</b> According to study plans
9	<b>Weighing factor of exam</b> 1.0
10	<b>Lecturers</b> <ul style="list-style-type: none"> <li>• Prof. Dr. Türk</li> </ul>
0	<b>Other information:</b> Language: English  <b>Literature:</b> Will be provided during the course

<b>Renewable Energy (REEN)</b>				
<b>Code</b>	<b>Workload</b>	<b>ECTS</b>	<b>Frequency</b>	<b>Duration</b>
Study Semester Renewable Resources	90 h	3 ECTS	Summer semester	1 semester
1	<b>Course</b> -Lectures -Seminar -Excursions	<b>Contact hours</b> 30 h	<b>Selfstudy</b> 60 h	

2	<p><b>Learning outcomes / competencies</b></p> <p>Upon completion of the module, students will</p> <ul style="list-style-type: none"> <li>• be conversant with criteria and issues related to sustainable energy sources.</li> <li>• be able to identify relevant problems, collect and discuss relevant data and published information.</li> <li>• be trained to calculate the heat demand for a building project.</li> <li>• be able to develop own solutions for a sustainable building and implement energy technology into a “real life” building project.</li> </ul>
3	<p><b>Content</b></p> <p>Background knowledge, calculation concept and planning basics for a self-sustaining building project including</p> <ul style="list-style-type: none"> <li>• Heat demand calculations</li> <li>• Energy - a history of growing demand and limited supply</li> <li>• Energy, Exergy, Anergy - thermodynamically matching sources to tasks</li> <li>• Definition: reserves / resources</li> <li>• Solar and non-solar Renewables</li> <li>• Geothermal energy, photovoltaics (PV), solar thermal energy, wind energy, biomass, evaluation of locations, invest and pay-back time / CO2 balance</li> </ul>
4	<p><b>Teaching and Didactics</b></p> <p>Lectures, case studies, seminar (group and individual work with short presentations) and excursions to agricultural enterprises and international organizations</p>
5	<p><b>Prerequisites</b></p> <p>Basic knowledge in physics</p> <p>Fluent English recommended (writing and orally, B2/C1)</p>
6	<p><b>Exam</b></p> <p>Presentation with discussion</p>
7	<p><b>Condition to award ECTS</b></p> <p>Pass of presentation and discussion</p>
8	<p><b>Recognition of Module in other study program</b></p> <p>According to study plans</p>
9	<p><b>Weighing factor of exam</b></p> <p>1.0</p>

10	<b>Lecturers</b> <ul style="list-style-type: none"><li>• Prof. Hartmann</li></ul>
0	<b>Other information:</b> Language: English <b>Literature:</b> Will be provided during the course