Course Description: Off-Grid Energy Supply

Department	Industrial Engineering
Degree programme	• Environmental Technology & Development • Environmental Technology
Module name	Off-Grid Energy Supply
Module number	WI-B.422
Compulsory/ optional/ elective module	Compulsory module
Module coordinator	Prof. Dr.-Ing. Stefan Rönsch
Learning objectives	The students: • know and understand the physical fundamentals of energy conversion as well as the function of common technical systems for the conversion of solar and wind and bioenergy into thermal or electrical energy, • know systems of storing thermal and electrical energy and their advantages and disadvantages, • know how to estimate the theoretical and technical potential of wind- solar- und bioenergy for given conditions • are able to estimate the thermal and electrical power needs for given technical applications • are able to compare energy supply systems in view of their impacts on environment and climate • are able to design energy supply systems for given applications considering economic and social factors
Module content	• Photovoltaics: basic principle, cell types, solar cell switching, efficiencies, potentials and costs • Thermal solar energy usage: basic principle, collectors, thermoelectric systems, efficiencies potentials and costs • Wind energy: basic principle, types of electrical generators, regulation, efficiencies, potentials and costs • Bioenergy: combustion of solid material, biogas, efficiencies, potentials and costs • Storage systems of electrical and thermal energy, efficiencies and costs • Combined heat and power: principle, energy and exergy balances • Exemplary systems for different applications
Course type (lecture, exercises, seminar, practical course)	0L – 0E - 1S - 1P
Recommended literature	/1/ G. Boyle, Renewable Energy, Oxford Univ. Press; 2004. /2/ B. Sørensen, Renewable Energy, Elsevier; 2005. /3/ M. Kaltschmitt, W. Streicher, A Wiese, Erneuerbare Energien, Springer, 2009. /4/ G. Brauner, Energiesysteme: regenerativ und dezentral,

	Strategien für Energiewende; Springer Vieweg, 2016. /5/ S. Bhattacharryya, Rural Electrification through decentralized off-grid Systems in Developing countries, Springer, 2014.
Learning materials	PowerPoint presentations, instructional and sample videos, Blackboard teaching
Method(s) of instruction/ media being used	Seminars, if necessary experiments
Level/ category	Bachelor
Which semester (winter/ summer term)	Winter term
Which semester during the programme	3rd semester
Requirements for attendance	
Assessment (written/ oral test, paper, etc.)	alternative examination: tests
ECTS credits	3
Work load in:	30 h of contact hours 60 h of self-study
Usability of this module	• Environmental Technology & Development • Environmental Technology
Frequency of offer	yearly
Duration of module	1 semester
Place/ room	EAH Jena
Time	According to schedule
Language(s)	English