Course Title: Renewable Energy

Course form	Lectures and exercises
Study type	Undergraduate (Bachelor level)
Module responsible	Prof. PhD Hermann Knaus, hermann.knaus@hs-esslingen.de
Language	English
Turnus	On request
Recommended prerequisites	English level B2
Course description	The course *Renewable Energy* provides a comprehensive introduction to the fundamentals of modern energy systems and key renewable energy technologies, including solar, wind, and hydropower. It covers the technical aspects of energy resources, energy conversion, system design, and grid integration. Students develop in-depth expertise in energy systems, taking into account all pertinent economic, social, and political framework conditions. The lectures are supplemented by exercises and discussions.
Skills	After successful completion of the module students should be able to: - Know, compare and analyse three major Renewable Energy conversion processes and technologies: photovoltaics, wind energy and hydropower - know how to integrate Renewable Energy supply into the energy system - critically evaluate impact on environment when implementing renewable energy supply systems
Content	1. Wind Energy - Wind Resources: Wind Atlas, Weibull-Distribution - Aerodynamic aspects of wind energy conversion, Betz's law - Design of wind turbines 2. Hydropower - Water Resources: catchment area, seasonal precipitation, dam and run off river power plants - Theoretical background: Euler's turbine equation, Bernoulli Equation - Design of hydro power plants, turbine types 3. Photovoltaics - Basic and most important properties of solar radiation related to photovoltaics - PV cells basics: Fundamental physical processes in photovoltaic materials - Characterisation and basic modelling of solar cells 4. System Integration - Power-to-X (PtX) 5. Summary and Exercises
Examination	Study Assignment

Credit hours	1,5
Credits	2
Literature	Volker Quaschning: Renewable Energy and Climate Change. John Wiley & Sons Ltd Chichester, 2nd edition 2019, ISBN 978-1-119-51486-2