Course: System Innovation Processes — credits: 5

Course code	SUVM23SIP
Name	System Innovation Processes
Study year	2025-2026
ECTS credits	5
Language	English
Coordinator	H.M. Moesker
Modes of delivery	Teaching method 1
Assessments	Multi Level Design Processes - Assignment

Learning outcomes

Design Process:
Understand and apply the various design phases and innovation processes to analyse, develop, test and evaluate radically new energy related systems.
The student is able to structure his/her work according to the phases of the given design process model, or an equivalent approach.
The student is able to determine strategic innovation bottlenecks and opportunities, and to translate these into concrete proposals that will support stakeholders in implementing the proposed solutions.

Design Tools:
Get to know several tools to support the development of new energy related solutions. Learning how to apply those tools in the various phases of the development process.
 The student is able to use the design tools that are addressed during the lectures, or the right equivalent of any of these tools.
o He/she is able to place them under the appropriate process phase, and in the right context (relative to other tools)
o He/she is able to apply them in a correct manner

Multilevel Design Model:
Understand and apply various aggregation levels of an energy related
project, based on the levels of the multilevel design model, and being able to shift between these levels.
 The student is able to subdivide their case into the system levels of the Multilevel Design Model (MDM).
 The student is able to give examples for their own case on each system level and in relation to the design phases (fill the MDM matrix meaningfully).

System thinking:
Apply the design phases and system levels to determine strategic innovation bottlenecks and opportunities. Translate these bottlenecks and opportunities into concrete innovation advice that will help stakeholders to systematically manage energy related development processes.
 The student is able to make a work breakdown structure of a product system
 The student is able to choose, define, and explain the system constraints of an energy related innovation case
 The student is able to propose alterations to the system when beneficial or necessary for a(self) designed concept, and describe the consequences the alterations might/will have on the total system (e.g. MDM-system)
 The student can apply the 100% rule to the case

Actor Analasys:
Define the involved actors. Determine their role and influence. Incorporate their interests during the design process. Relate them to the potential change and innovation processes on the various system levels of the MDM.
 The student is able to identify all relevant actors in a product system (e.g. companies, government, customers, research and societal organizations)
 The student is able to interrelate / map the motivation and

Content

The ‘System Innovation Processes’ module is based on the understanding that developing new energy-related products, services and systems is a complex process with many interrelated variables. Each of these variables may be closely related to others, for instance when a new energy-efficient technology can only be implemented when new infrastructure is implemented. Or when new regulations are needed to be able to test new types of energy sources.

The objective of the ‘System Innovation Processes’ module is to work on the design of complex energy related systems, specifically looking at the multidisciplinary and multilevel aspects of this process. The module is not so much aimed at the design of the technological energy system as such, but aims to position the development of the physical or tangible energy system, in relationship to the related changes in the societal, organizational, and user context within which the technological system is functioning.
In this module, the student will get acquainted with the execution and management of such a complex design process and the related change processes. The main aim of the module is to acquire hand-on experience and ‘tacit knowledge’ in this area.
In the module, the basic design process will be applied. The student will learn to distinguish between the various design phases, and to structure an energy related design process according to those phases.

The module will aim at understanding and applying the basic concept of systems thinking, enabling students to separate energy related problems and solutions in smaller elements, among others by applying a work breakdown structure and a morphological analysis process.

The module is based on the Multilevel Design Model. This framework consists of a typical four-phase iterative design process (reflection, analysis, synthesis, experience), combined with a hierarchical system oriented perspective based on four system levels (product-technology system, product-service system, socio-technical system and societal system).
In the module, students will get acquainted with several design tools like Future Visioning, System Mapping, Story Boards, Scenario Building and Business Model Canvas

interests of actors, related to the various MDM system levels
 The student is able to identify opportunities and risks related to the interests of the various related actors
 The student can identify several strategies how to deal with these opportunities and risks

Presentation:
Apply the design phases and system levels to determine strategic innovation bottlenecks and opportunities. Translate these bottlenecks and opportunities into concrete innovation advice that will help stakeholders to systematically manage energy related development processes.
 The student is able to present his/her work orally and support this with a presentation.
 The student incorporates presentation tools, such as persona, collaging and/or other mentioned tools that assist an outsider in understanding.
 The student is able to write a paper by scientific standard (with the aid of a supplied format)

Included in programme(s)

European Master in Sustainable Energy System Management

School(s)

Institute of Engineering

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