Course syllabus

Grunderna för tekniska system
Fundamentals of Technical Systems

IMEN04, 5 credits, A (Second Cycle)

Valid for: 2018-2019 XAMIS
Decided by: PLED W
Date of Decision: 2018-03-22

General Information

Main field: Environmental Management and Policy. Depth of study relative to the degree requirements: Second cycle, has only first-cycle course/s as entry requirements.
Compulsory for: XA_EMP1
Language of instruction: The course will be given in English

Aim

The course aims at providing students with an understanding of the rationales of technical systems, how socio-technical systems have evolved and what techniques and technologies these systems consist of. The course thus gives the students tools to explain transitions in technical systems as well as fundamental scientific and technological terms, concepts and laws to explain the systems in order to propose environmental optimisations.

Learning outcomes

Knowledge and understanding
For a passing grade the student must

• Demonstrate the ability to describe fundamental scientific and technological terms, concepts, and laws that are relevant to environmental optimisation of technical systems.
• Explain the main operating principles of technical systems in the areas of energy, built water systems, waste management, as well as inputs to and services provided by the systems.
• Demonstrate understanding on systems inter-connections.
• Demonstrate understanding of key environmental technologies by describing operating principles and typical applications
• Describe and contrast technical systems at micro, meso, and macro levels, for instance at plant level, at city level and at regional, national or international level.
• Explain key principles of theories of transitions in socio-technical systems, and apply this in order to explain how change have happened/can happen in socio technical systems.

Competences and skills
For a passing grade the student must

• Contextualize and explain changes in relation to theories of transitions in socio-technical systems.
• Interact with professionals working with technical systems and being able to relate theoretical knowledge and understanding to real-world applications.
• Describe technical systems and environmental technologies for their peers (written, illustrations, and oral).
• Provide constructive peer-feedback.
• Demonstrate the ability to plan and execute course assignments within given time limits, using relevant methods for completing the assignment.
• Assess the relevance of alternative technical solutions for typical environmental challenges

Judgement and approach

For a passing grade the student must

• Demonstrate the ability to contrast and compare environmental appropriateness of technical solutions as well as socio-technical systems solutions.
• Demonstrate the ability to identify the personal need for further knowledge by making use of peer-feedback and experiences from the course and take responsibility for his or her ongoing learning.
• Demonstrate the ability to search, evaluate, and select relevant information regarding existing technical systems from public sources.

Contents

The course consists of six modules that relate to each other:

Systems module: the module intends to demonstrate societal developments by placing evolvements of socio-technical systems in contexts of the historical development of industrialisation and theories for transformations. The concept of technical and socio-technical systems will be explained.

Scientific and technological terms, concepts, and laws module: the module introduces concepts such as energy, power, entropy, energy and matter quality; mass and heat transfer, basic laws of thermodynamics & diminishing returns and their implications

Energy systems and technologies module: the module covers energy systems, systems components, fuels and primary energy resources, energy conversion technologies, energy carriers, environmental issues related to energy systems, domestic and industrial energy use and services.

Environmental technologies module: the module explains key separation technologies commonly used for protection of the environment and human health, including their working mechanisms, operational characteristics, main applications in industry, as well as their advantages and disadvantages.

Built water systems module: this module covers water resources and uses, water quality, the built water systems for treatment and provision of drinking and process water, collection systems for wastewater and the treatment thereof. The module also serves as demonstrating the environmental technologies that are commonly in use.

Solid waste systems and technologies module: this module deals with waste hierarchy, waste generation and composition of waste, collection systems, reuse and recycling and final treatment form a systemic perspective. In the module, relevant key environmental technologies for waste systems as well as waste treatment are presented and applied.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)
Assessment: Participation in study visits, assignments, presentations, and feedback sessions is mandatory. The final grade is based on three module related quizzes and a final written exam.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Admission

Admission requirements:

• Students should have been admitted to the MSc Programme in Environmental Management and Policy
The number of participants is limited to: No
The course overlaps following course/s: IMEN14

Reading list

- According to a literature list that will be available at the latest eight weeks before start of the course on the course web page.

Contact and other information

Course coordinator: Åke Thidell, aake.thidell@iiiee.lu.se
Course homepage: http://www.iiiee.lu.se/education/emp/curriculum