Module Description, available in: EN

Lifecycle Management of Infrastructures

General Information

Number of ECTS Credits

3

Module code

FTP_Life

Valid for academic year

2020-21

Last modification

2020-02-17

Coordinator of the module

Christoph Heitz (ZHAW, christoph.heitz@zhaw.ch)

Explanations regarding the language definitions for each location:

- Instruction is given in the language defined below for each location/each time the module is held.
- Documentation is available in the languages defined below. Where documents are in several languages, the percentage distribution is shown (100% = all the documentation).
- The examination is available 100% in the languages shown for each location/each time it is held.

	Lausanne			Lugano	Zurich		
Instruction					**X** E 100%		
Documentation					**X** E 100%		
Examination					**X** E 100%		

Module Category

FTP Fundamental theoretical principles

Lessons

2 lecture periods and 1 tutorial period per week

Entry level competences

Prerequisites, previous knowledge

Basic knowledge in mathemetics (introductory lecture in analysis and linear algebra)

MS Excel (implementation of formulae, graphs)

Brief course description of module objectives and content

In this module, students are introduced into basic concepts of lifecycle management of infrastructures with respect to costs vs benefit. Established cost and benefit models of infrastructures are discussed. Based on lifecycle costs analysis, we introduce different methods for the assessment of maintenance strategies, and for decision making with respect to construction, preservation, and replacement. The cost-based approaches are complemented with methods for the analysis of reliability, availability, and risk.

Aims, content, methods

Learning objectives and acquired competencies

- the students understand the function and the benefit of infrastructures, and their effect on society, economy, and environment
- the students are familiar with the challenges for sustainable development of infrastructures
- the students are familiar with concepts to derive requirements for infrastructures, their verification and validation.
- the students are familiar with the most important methods for decision making in infrastructure management, and are able to apply those methods in concrete cases; for example the calculation of life cycle costs or socio-economic impact, or the simulataneous minimization of costs and risks at maximum benefit.
- the students are familiar with the different maintenance strategies (reactive, preventive, condition-based)
- the students know different models of failure and wear behavior, and can apply them
- students know the concepts of reliability theory
- the students know the methods of risk analysis and risk management and can apply them
- the students are familiar with the method of risk-based maintenance, and can apply this method for maintenance management

Contents of module with emphasis on teaching content

- basic concepts
  - introduction into the infrastructure networks of electricty, water, road, and rail
  - social, political and economic dimension and relevance of infrastructures
  - concepts of cost and benefit assessment
  - standards for life cycle management
- infrastructure costs
  - life cycle costing
  - concepts, methods, and instruments for the analysis of economic performance
  - state and state dynamics
  - monetary models of benefit and their limits
  - maintenance strategies and replacement
- assessment methods
  - cost-benefit analyses
  - utility analysis
- processes and activities during the lifecycle
  - requirements for infrastructure assets
  - failure and degradation behavior of systems and components, and modeling
  - methods and models for reliability and maintenance
  - condition-based and preventive maintenance, optimum maintenance cycles
- risk analysis and risk management of infrastructure
  - what is risk?
  - risk analysis, risk mitigation, and risk acceptance
  - risk management
  - risk-based maintenance

Teaching and learning methods

Lecture: Introduction in the relevant concepts with examples

Exercises: applications and use cases

Literature

Supplementary publications.

Note: Since part of the module content is based on Swiss standards, some literature is provided in German/French only.

Assessment

Certification requirements

Module does not use certification requirements

Basic principle for exams

As a rule, all the standard final exams for modules and also all resit exams are to be in written form

Standard final exam for a module and written resit exam

Kind of exam

written

Duration of exam

120 minutes

Permissible aids

Aids permitted as specified below:

Permissible electronic aids

calculator (not programmable)

Other permissible aids

summary of content (max 20 pages)

Special case: Resit exam as oral exam

Kind of exam

oral

Duration of exam

30 minutes

Permissible aids

No aids permitted