

## JCSS Advanced Course on Systems Risk Modelling and Analysis in Engineering Decision Making

### Decision Analysis, Probabilistic Systems Modeling, Probability Analysis, Risk Assessment - and Applications

**May 14-18, 2018**

#### Organizers

Joint Committee on Structural Safety  
Group on Risk and Reliability, Department of Civil  
Engineering, AAU, Denmark  
Danish Hydrocarbon Research and Development  
Centre  
K-FORCE Erasmus+ Project

#### Teachers

Prof. M. H. Faber, AAU, DK  
Prof. J. D. Sørensen, AAU, DK  
PhD. M. Schubert, Matrisk GmbH, CH  
Prof. J. Nielsen, AAU, DK  
Prof. J. Qin, AAU, DK  
Prof. S. Miraglia, AAU, DK

#### Motivation

Methods of reliability, risk and safety assessment are increasingly gaining importance as decision support tools across the engineering sciences.

In order to utilize these methods and to exploit their potential in research, public governance and industrial applications a deep understanding of the fundamental principles is necessary.

#### Course contents

The present course provides the background, methods and tools for decision analysis on the optimal management of engineered systems.

Topics/lectures of the course include:

- Statistics and Bayesian probability theory
- Probabilistic modeling in engineering
- FORM, SORM and MC techniques
- Components and systems reliability
- Bayesian Probabilistic Nets
- Engineering decision analysis
- Probabilistic structural analysis
- Optimization and acceptance criteria
- Cases studies

Application domains include, but are not limited to transport infrastructures, energy production and distribution systems, buildings and structures, offshore and marine systems.

The course consists of lectures, exercises, mini-projects and self-study. Lecture notes will be provided in advance of the course.

#### Evaluation and certificates

The evaluation of the course is based on:

1. The solutions to the exercises produced by the participants during the course
2. A mini-project submitted by the students within two weeks after the completion of the course.

The reports documenting the mini-projects are assumed to be in the order of 10-15 pages.

Three (3) ECTS point will be given to participants participating and satisfactorily solving the exercises during the course.

Additional two (2) ECTS points (total of five ECTS points) will be given to participants who choose also to submit a mini-project – provided this is positively evaluated.

Successful evaluations will be recognized by a JCSS Diploma.

#### Participants

The course is intended for PhD students, academics and professionals from the industry and public authorities, working in the field of risk informed management of engineered facilities and structures in the area of civil engineering, such as:

- Bridges, tunnels and roadway systems
- Wind turbines and wind turbine parks
- Electricity grid systems
- Offshore oil and gas production facilities

The course is offered at national and international level. All lectures will be given in English.

### Venue and time

The present course on Decision Support for Management of Engineered Systems will take place on **May 14 - 18, 2018** at the Department of Civil Engineering at Aalborg University.

### Registration, costs and accommodation

Participants must register before **23.04.2018** through the AAU PhD School Home Page:

Course participation is free for PhD students from Denmark and any other of the Nordic Countries. For all other course participants a registration fee of EUR 400.- applies.

The course registration fee covers participation in the course and study materials.

All participants are offered coffee or refreshments at coffee breaks and a course dinner event for additional Euro 100.-.

Participants are responsible for organizing and paying for their own travel, meals, and accommodation.

Since there may be limitations on the total number of participants to the course, attendance will be granted in accordance with the order of registrations – “first come – first serve”.

By **April 30, 2018** all registered participants will be notified with regards to their attendance and provided details with respect modes of registration payments.

### Further information

Further information can be found at the home page: <https://phd.moodle.aau.dk/course/index.php?categoryid=135>, or from: Ruth Klitte, e-mail: rk@adm.aau.dk.

### Preliminary course program

Time	May 14	May 15	May 16	May 17	May 18
08:30-10:00	Introduction Basics of statistics and probability	Decision analysis	Bayesian Probabilistic Nets II	Roadway and tunnel risk modelling	Integrity management of large concrete bridges
10:00-10:30	Coffee break	Coffee break	Coffee break	Coffee break	Coffee break
10:30-12:00	Probabilistic systems engineering I	Methods of structural reliability I	Probabilistic design and assessment of structures	Integrity management of offshore structures	Robustness and resilience of electrical distribution systems
12:00-13:00	Lunch	Lunch	Lunch	Lunch	Lunch
13:00-14:30	Probabilistic systems engineering II	Methods of structural reliability II	Risk informed inspection and maintenance planning	Integrity management of offshore well head facilities	Introduction to mini-project Open questions and discussions
14:30-15:00	Coffee break	Coffee break	Coffee break	Coffee break	Coffee break
15:00-16:30	Optimization and risk acceptance	Bayesian Probabilistic Nets I	Value of Information in Structural Health Monitoring	Integrity management of wind turbine facilities	Mini-project work
16:30-18:00	Exercises I	Exercises II	Exercises III	Exercises IV	Closure