LUND UNIVERSITY
Faculty of Science

# Syllabus for the course Bayesian Analysis and Decision Theory, NAMV005

*Swedish title: Bayesiansk analys och beslutsteori*

**The course syllabus was confirmed by the Faculty board for graduate studies on 19 December 2017. The course is in the third cycle and amounts to 5 credits**
*This is a translation of the course syllabus approved in Swedish.*

**Learning outcomes**

*Knowledge and Understanding*

Upon completion of the course, the student shall:

- Be able to give an account of the principles behind Bayesian decision analysis,
- Be able to give an account of the principles behind Bayesian and hierarchical modelling,
- Be able to give examples of principles to quantify and treat uncertainty in quantitative assessments,
- Be able to give an account of science theoretic arguments behind principles to quantify and treat uncertainty in knowledge production and decision making

*Competences and Skills*

Upon completion of the course, the student shall:

- Be able to specify a Bayesian decision analysis for a concrete problem,
- Be able to specify a Bayesian hierarchical model and interpret its parameters,
- Be able to examine the validity of a Bayesian Belief network model and make suitable modifications of the model,
- Be able to use some statistical computer program for analysis of Bayesian Belief networks, and interpret the results,
- Be able to use some statistical computer program for analysis of Bayesian hierarchical models, and interpret the results,
- Be able to identify and treat sources of uncertainty in a decision analysis,
- Be able to present the analysis and conclusions of a practical problem in a written report.

*Judgement and Approach*

Upon completion of the course, the student shall:

- Be able to discuss and analyze uncertainty in models and their predictions,
- Be able to reflect over the limitations and arguments for scientific principles to specify a decision problem and to produce knowledge to support the decision problem.

**Course content**
Bayesian Decision Theory, Bayesian analysis, Discrete Bayesian Belief Networks, Hierarchical modelling, Continuous Bayesian Belief Networks, Probabilistic uncertainty analysis, Non-probabilistic methods for uncertainty analysis, Scientific principles to quantify uncertainty, Principles of cautious decision making.

**Teaching**
Lectures, computational laboratory exercises, literature seminar, individual project work (under supervision).

**Assessment**
Assessment is based on student activities in practical exercises and seminars, and on the written project report.

**Grading scale**
Possible grades are Pass and Fail. For a grade of pass, the student is required to have participated in all practical exercises and seminars and to have passed the written report. The student must demonstrate, through the written report and through the engagement in the seminars and exercises, an independent, reflective, well-informed and critical relationship to the issues presented in the course.

**Language**
The course is given in English.

**Entry requirements**
Basic knowledge in probability theory.