Offered by
ICT Engineering

IT-SMP1

1.0

Stochastic Modelling and Processing

ECTS
5

Prerequisites
Upper level mathematics equivalent to A-levels. Calculus.

Main purpose
The ubiquitous presence of uncertainty and noise in the engineering sciences makes it mandatory to understand and quantify random phenomena. To achieve this goal the course will provide a solid introduction to the theory of stochastic processes. Special attention is given to applications and the student will model and analyse complex stochastic situations as encountered in practice. The applications include examples from various engineering fields such as information technologies and communications, signal processing, and more.

Knowledge
After successfully completing the course, the student will have gained knowledge about:

- The main working tools and concepts of stochastic modelling
- Probability theory and distributions
- Inferential statistics

Skills
After successfully completing the course, the student will be able to:

- Apply results from basic probability theory including conditional probability
- Use probability density and distributions functions of one and two variables
- Account for random variables and random processes
- Account for the processing of random signals in linear systems
- Calculate and interpret auto- and cross-correlation functions for random signals
- Calculate and interpret power density spectra and coherence functions
- Calculates and estimate errors and uncertainties.

Competences
After successfully completing the course, the student will have acquired competencies in:

- Planning experiments and state hypothesis
- Presenting statistical results from experiments
- Modelling experimental data with regression
- Analysing experimental results and test hypotheses.

Topics

- Experiments and the concepts of probability
- Calculations of probability
- Often encountered probability density and distribution functions
- Random variables and random processes
- Auto- and cross-correlation functions and correlation coefficients
- Power density spectra and coherence functions
- Analysis of errors in experiments
- Design of statistical experiments
- Creating hypotheses and confidence intervals
- Presentation of statistical data
- Linear and exponential regression
- Analysis of variance

Teaching methods and study activities
Approximately 150 hours. The course is a mixture of lectures, problem solving and computer/laboratory exercises with approximately 1/3 of the time devoted to each part.

Study Activity Model

Resources
Montgomery, D.C. & Runger, G.C. *Applied Statistics and Probability for Engineers*, 4th edition Wiley (obtained from library)
Cooper, G.R. & McGillem, C.D. *Probabilistic Methods of Signal and System Analysis*, 3rd edition. Oxford University Press (electronic version will be made available).

Evaluation
Grading will be done according to the 7-scale, using an internal examiner.

Examination

The final exam is a 3 hour written exam and takes place at Campus Horsens. Supplementary materials and aids are allowed. All supplementary materials and aids are allowed, e.g. using a computer as a reference work. Communication of any sort is not allowed during the exam and will lead to expulsion of all involved parties from the exam.

Grading criteria
According to the 7-point grading scale, interrnal examiner.

Mark 12:
Awarded to students who have shown excellent comprehension of the above-mentioned competences. A few minor errors and shortfalls are acceptable.

Mark 02:
Awarded to students for the just acceptable level of comprehension of the required competences.

Additional information
For more information, please contact Richard Brooks (rib@via.dk)

Responsible
Richard Brooks

Valid from
1.8.2016

Course type
ICT Engineering;6. semester;7. semester;Electives;