FSG3130 Osäkerhetsanalys 5,0 hp

Uncertainty Analysis

När kurs inte längre ges har student möjlighet att examineras under ytterligare två läsår.

Fastställande

Kursplan för FSG3130 gäller från och med VT14

Betygsskala

Utbildningsnivå

Forskarnivå

Särskild behörighet

A master degree in a mechanics related area is recommended.

Undervisningsspråk

Undervisningsspråk anges i kurstillfällesinformationen i kurs- och programkatalogen.

Lärandemål

The student will be able to discuss general issues regarding mainly experimental uncertainties relevant for measurements with special focus to fluid dynamic systems, the difference between systematic and random errors (bias and uncertainty), confidence intervals, calibration errors, error propagation in data reduction equations, regression analysis etc. There will also be a discussion about how to determine the uncertainty propagation by using Monte

Carlo analysis. The uncertainty analysis will be exemplified through discussion of various real-life experiments (and to some extent simulations). Although many of the examples are taking from the fluid dynamics field, the discussion of the uncertainty analysis is general and can be applied to many other scientific fields. After completing this course the student should be able to:

- distinguish between random and systematic (uncertainty and bias) error.
- understand basic statistical concepts and the meaning of confidence intervals.
- calculate uncertainty in a measured variable based on the Taylor series method.
- perform a Monte-Carlo based uncertainty analysis.
- evaluate how long time a variable need to be sampled in order to obtain a certain accuracy in the measured/simulated statistics.
- handle outliers in a reliable and systematic way.
- design, debug and execute an experiment.
- understand the difference between validation and verification of simulations, and how validation can be performed.
- do an accurate regression analysis.

Kursinnehåll

1. Experimentation, Errors and Uncertainty
2. Errors and Uncertainties in a Measured Variable
3. Uncertainty in a Result Determined from Multiple Variables
4. General Uncertainty Analysis. Planning an Experiment and Application in validation
5. Detailed Uncertainty Analysis: Designing, Debugging, and Executing an Experiment
6. Validation of Simulations
7. Data Analysis, Regression, and Reporting of Results

Kursupplägg

The lecture part of the course is given in a compressed time scale with approximately 20h of lectures during 1-2 weeks.

Kurslitteratur

H.W. Coleman & W. Glenn Steele: Experimentation, validation, and Uncertainty Analysis for Engineers

(3rd Edition), Wiley

Examination

Examinator beslutar, baserat på rekommendation från KTH:s handläggare av stöd till studenter med funktionsnedsättning, om eventuell anpassad examination för studenter med dokumenterad, varaktig funktionsnedsättning.

Examinator får medge annan examinationsform vid omexamination av enstaka studenter.

Etiskt förhållningssätt

- Vid grupparbete har alla i gruppen ansvar för gruppens arbete.
- Vid examination ska varje student ärligt redovisa hjälp som erhållits och källor som använts.
- Vid muntlig examination ska varje student kunna redogöra för hela uppgiften och hela lösningen.