



Course for Ph.D. students:

Experimental Methodology (MVK030F)

7.5 hp

March 6 – June 5, 2018

Contact:

Prof. Öivind Andersson

ovind.andersson@energy.lth.se

046-222 85 25

Objective

The course aims to give a deeper understanding of the experimental method. It provides students with basic knowledge about fundamental concepts and techniques that are applied across a wide range of experimental research fields. To aid understanding, these are presented in a practical context. The course is built around examples and exercises as well as a small research project where the central concepts and techniques are applied.

Aim

After the course the student should:

- Understand the most basic concepts in science theory and how they apply to research in practice
- Understand the difference between experimentation and passive observation
- Be able to plan and carry out experiments that result in explanatory knowledge
- Understand the principles of statistical hypothesis tests and apply the most common ones
- Understand the limitations of intuitive experimental procedures, such as changing one factor at a time or running trial-and-error experiments
- Have basic functioning knowledge of Design of Experiments (DoE)

Prerequisites

The course corresponds to 7.5 hp and is primarily intended for Ph.D. students. No previous courses are required. To pass the course the student must pass the written exam and participate in the project work, consisting of planning and carrying out a small “research” project. The project results are to be presented in a short paper, which will be peer-reviewed by other participants. Finally, the results will be presented at a final workshop. To pass the course, students must also complete assignments and participate in compulsory assignment reviews, as well as attend a majority of the lectures.

Literature and software

The course book is Andersson, [*Experiment! – Planning, Implementing and Interpreting*](#).

Assignments may be carried out using Microsoft Excel or Mathworks Matlab. Lecture material and assignments are distributed during the course. The course will be given in English.

Lectures

Place: Combustion Physics (Enoch Thulin Laboratory, Sölvegatan 14, Lund)

Room: E421 (“the green room”).

Tue 6/3	10-12	Experimental method I
Thu 8/3	13-15	Basic statistics
Tue 13/3	10-12	Confidence intervals, correlation and regression
Thu 15/3	10-12	Introduction to hypothesis testing, <i>t</i> -tests
Tue 20/3	10-12	Phase I: Planning
Thu 22/3	10-12	<i>Assignment review: General statistics (compulsory)</i>
Tue 27/3	10-12	ANOVA, Experimental method II
Tue 3/4	10-12	Characteristics of research, Introduction to DoE
Tue 17/4	10-12	Phase II: Data Collection, Phase III: Analysis & Synthesis
Thu 19/4	10-12	<i>Assignment review: Case study (compulsory)</i>
Tue 24/4	10-12	Full factorial designs
Thu 26/4	10-12	Screening designs, Response surface designs
Thu 3/5	10-12	<i>Assignment review: Screening (compulsory)</i>
Thu 31/5?	?	Exam
Tue 5/6	All day	Final seminar (compulsory)

Projects will be carried out in small groups from April 16. The teacher will schedule meetings with the project teams from April 16 and on to plan the projects.

Registration

Please send an e-mail to oivind.andersson@energy.lth.se in order to register for the course. The maximum number of participants is 30 and admission is handled on a first-come first-served basis.