



Experimental Modelling in Energy and Process Engineering

5 ECTS

Lecturer: **M. Hočevar, M. Dular**

Lectures: 30h

| Tutorials: 6h

| Labs: 24h

| Project: 0h

| Lang.: 

Objectives

- To understand the principle of experimental modeling in energy and process engineering and the importance of the pre-development of products.
- Know the basic building blocks of measuring stations.
- Understand the importance of performing an experiment appropriately in energy and process engineering.
- Link the performance of the experiment to the operation of machines and devices.
- Understand the process of experimental modeling in the development of energy and process machines and devices.

Programme

- Introduction, the role of pre-development, the importance of experimental modeling
- Fitting: examples, use, common fitting functions, splines, conditions
- Similarity theory: importance, non-dimensional numbers, Cordier diagram, application
- Procedures for measuring in energy and process systems: measuring station categories, measured variables, auxiliary machine, flow choking, flow straighteners, pressure and losses
- Measuring stations: measuring equipment for flow, pressure, torque, rotational frequency; design of measurement stations; determination of machine characteristics
- Importance and method of measuring electrical power and mechanical power
- Variables in experimental modeling: input and output variables, selection, parameters, functional dependence, statistical methods
- Experimental design and data pre-processing: white, gray and black boxes, design of experiment, standard deviation and variance, experiment models, degrees of freedom
- Linear regression models
- Exponential regression models
- Application – detailed presentation of 3 pre-development cases

Prerequisites

Meeting the enrolment conditions for the Master's study programme of Mechanical Engineering - Research and Development program.

Learning outcomes

After attending this course, the student will:

- Have in-depth theoretical, methodological and analytical knowledge with elements of research, which is the basis for very demanding scientific and professional work in the field of experimental modeling in energy and process engineering.
- Be able to prepare complex experiments to demonstrate the operation of energy machines and process systems.
- Be able to apply modern development methods in the field of energy machines and process systems.

Assessment

- Participation in lab work – 80 % participation minimum
- Lab report – all reports must be submitted
- Laboratory exams – 50 %
- Theoretical exam – 50 %

Literature

- Marko Hočevar, Eksperimental modeling, Fakulteta za strojništvo, study material, 2019.
- H. T. Tran and H. Thomas Banks, Mathematical and Experimental Modeling of Physical and Biological Processes, Boca Raton : CRC Press, c2009.