Study program: Mechanical engineering

Type and level of studies: Doctoral studies

Course unit: Design of Experiments

Teacher in charge: prof. dr Milan Kolarević

Language of instruction: English

ECTS: 5

Prerequisites: None

Semester: Spring

Course unit objective:

Introduction to the mathematical theory of modern concepts of planning and analysis of experiments and possibilities of application of the methodology DOE (Design of Experiments) to solve the problem of optimization technology and manufacturing processes.

Learning outcomes of the course unit

Mastering complex statistical methods and procedures for planning and analysis of experiments in order to solve practical engineering and scientific problems.

Course unit contents

Theoretical classes

- Experiment as an object of scientific investigation.
- Basis of statistical concepts. The role of statistics in the design and analysis of experiments. Mathematical and statistical modeling. Statistical inference.
- Basic methods in the theory of experiments. The division of experimental plans. Analysis of variance (ANOVA). One-factor plans. Two-Factor plans. Multifactor plans.
- Regression analysis. Basic concepts. Simple linear regression model. Simple curvilinear regression. Model of a multiple linear regression. Models of multiple nonlinear regressions.
- Experiments with mixtures (experiments with mixtures). The properties of the mixture. Simplex plan. Scheffe's simplex plan. Draper-Lawrence plan. The basic regression models. The graphical representation of the model in a triangular coordinate system.
- Special plans for process improvement. Taguchi methods.

Practical classes

The practical realization of experiments in the laboratory

Literature

R.L.Mason, R.F.Gunst, J.L.Hess, *Statistical Design and Analisis of Experiments, With Applications to Engineering and Science*, Second Edition, A John Wiley&Sons Publication, Hoboken, New Jersey, 2003.

G.P.Box, N.R.Draper, *Response Surfaces, Mixtures, and Ridge Analises*, Second Edition, A John Wiley&Sons Publication, Hoboken, New Jersey, 2007.

J. Cornell, *Experiments with Mixtures, Designs, Models, and the Analisis of Mixture Data*, Third Edition, A John Wiley&Sons Publication, Hoboken, New York, 2002.

R.H. Myers, D.C. Montgomery, C.M. Anderson-Cook, *Response Surface Methodology*, Wiley, 2009.

Number of active teaching hours				**Other classes**
Lectures: 3	Practice: 1	Other forms of classes:	Independent work: 1	

Teaching methods

Lectures. Numerical computational exercises. Seminar. The practical realization of experiments in the laboratory.

Examination methods (maximum 100 points)

Exam prerequisites	**No. of points:**	**Final exam**	**No. of points:**
Student's activity during lectures		oral examination	
practical classes/tests	40	written examination	
Seminars/homework		.....	
Project	60		
Other			

Grading system

Grade	**No. of points**	**Description**
10	**91-100**	Excellent
9	**81-90**	Exceptionally good
8	**71-80**	Very good
7	**61-70**	Good
6	**51-60**	Passing
5	**Less than 50**	Failing