Design of experiments - opis przedmiotu

Informacje ogólne

Nazwa przedmiotu	Design of experiments
Kod przedmiotu	06.9-WM-ZiIP-IJ-ANG-D-16_20
Wydział	Wydział Mechaniczny
Kierunek	Management and Production Engineering
Profil	ogólnoakademicki
Rodzaj studiów	drugiego stopnia z tyt. magistra inżyniera
Semestr rozpoczęcia	semestr zimowy 2021/2022

Informacje o przedmiocie

Semestr	2
Liczba punktów ECTS do zdobycia	5
Typ przedmiotu	obowiązkowy
Język nauczania	angielski
Sylabus opracował	• dr inż. Iwona Pająk

Formy zajęć

Forma zajęć	Liczba godzin w semestrze (stacjonarne)	Liczba godzin w tygodniu (stacjonarne)	Liczba godzin w semestrze (niestacjonarne)	Liczba godzin w tygodniu (niestacjonarne)	Forma zaliczenia
Projekt	30	2	-	-	Zaliczenie na ocenę
Wykład	30	2	-	-	Egzamin

Cel przedmiotu

Knowledge of issues related to the planning of experiments, developing the ability to analyse the results of measurements, using statistical methods of analysis.

Wymagania wstępne

a course in mathematical statistics

Zakres tematyczny

Lecture*:*

L1-2: Introduction. Basic concepts: scientific research, experimental research, theory of experiment, experience, active and passive experiment. Classification of experimental plans. Theoretical basis of experimental research. Problem identification and formulation. Choice of response variables. Selection of factors to be varied. Establishing a research method: choice of experimental design, determining the number of replicates. Statistical analysis of the data.

L3-4: Review of problems in mathematical statistics. Statistical distributions and their parameters. Point estimation: measures of central tendency, measures of spread/dispersion and measures of distortion. Data analysis through graphical presentation (histogram, box plot, quantile-quantile plot, normality plot, scatter plot). Hyphotesis testing: inference about the differences in means and goodness-of-fit tests.

L5: Simple comparative experiments. Analysis of the experiments results using of two-Sample t-Test. Checking assumptions: graphical analysis as well as tests for equality of the variances of two populations and goodness-of-fit tests.

L6: Power analysis and calculation minimum sample size. Standarized effect and effect. Determining sample size (umber of replicates).

L7-8: Experiments with a single factor. One-way ANOVA. Checking assumptions. Post-hoc tests. Effect size and measures. Selected measures of the effect. Determining sample size.

L9-10: Experiments with two factors. Factorial designs: main effects and interactions. Two-way ANOVA. Checking assumptions. Post-hoc tests. Determining sample size.

L11: Two and multidimensional random variables. Measures of dependence among random variables.

l12-13: Regression analysis. Linear Regression. Least squares method. Regression equation quality indicators. Hypothesis testing in multiple regression: test for significance of regression, tests on individual regression coefficients. Checking assumptions - residual analysis.

L14: Stepwise regression. Single factor experiments: relationships between analysis of variance and analysis of regression.

L15: Experimental designs. Full and fractional factorial designs: two-level, three-level and multi-level.

Project*:*

P1-P3: Carrying out a simple comparative experiment. Analysis of experiment results. Checking assumptions. Power analysis. Checking the sample size for the desired effect.

P4-P6: Conducting a two-factor experiment. Analysis of experiment results. Checking assumptions. Power analysis. Checking the sample size for the desired effect..

P7-P9: Conducting an experiment to develop a model of the selected process. Analysis of experiment results. Checking assumptions.

P10-P12: Presentation of the results.

P13-P14: Verification of solutions - passing the projects.

Metody kształcenia

Lecture*:* a conventional lecture

Project*:* a project implemented in groups or individually

Efekty uczenia się i metody weryfikacji osiągania efektów uczenia się

Opis efektu	Symbole efektów	Metody weryfikacji	Forma zajęć
The student is able to prioritise and carry out his/her own tasks as well as the tasks of others.	• K_K04	• projekt	• Projekt
The student is able to plan experiments in mechanical engineering and is able to work out the results of an experiment, draw conclusions, formulating opinions in the process and sufficiently justifying them.	• K_U02	• egzamin - ustny, opisowy, testowy i inne • projekt	• Wykład • Projekt
The student is able to plan and carry out experiments, including measurement and computer simulations, interpret the results and draw conclusions.	• K_U22	• egzamin - ustny, opisowy, testowy i inne • projekt	• Wykład • Projekt
The student has a thoroughly extensive knowledge of the application of computer aided, numerical methods as applied to source and data analysis.	• K_W03	• egzamin - ustny, opisowy, testowy i inne • projekt	• Wykład • Projekt
The student has orderly and specific theoretical knowledge of branches, within a chosen speciality Quality engineering.	• K_W15	• egzamin - ustny, opisowy, testowy i inne • projekt	• Wykład • Projekt

Warunki zaliczenia

Lecture: written exam preceded by obtaining a credit for project classes

Project: arithmetic mean of the grades obtained for each project activity

Final grade: the condition for passing the course is to pass all its forms, the final grade for the course is the arithmetic mean of the grades for individual forms of classes

Literatura podstawowa

1. Montgomery D. C., Design and Analysis of Experiments, Wiley, 2012
2. Dean A., Voss D., Draguljić D., Design and Analysis of Experiments, Springer, 2017
3. Hines W. W., Montgomery D. C., Goldsman D. M., Borror C. M., Probability and Statistics in Engineering, Wiley, 2003

Literatura uzupełniająca

1. Toutenburg H., Statistical Analysis of Designed Experiments, Springer, 2002
2. Davim J. P., Design of Experiments in Production Engineering, Springer 2016
3. Wild C. J., Seber G. A. F. , Chance Encounters: A First Course in Data Analysis and Inference, Wiley, 1999

Uwagi

Zmodyfikowane przez dr inż. Iwona Pająk (ostatnia modyfikacja: 03-05-2021 14:28)