MSE-629

Design and analysis of experiments in materials science and engineering (2019)

Lemaître Jacques

Cursus	Sem.	Type
Materials Science and Engineering		Obl.

Language of teaching	English
Credits	2
Session	
Exam	Written
Workload	60h
Hours	**28**
Courses	14
TP	14
Number of positions	**15**

Frequency

Every year

Remark

Will not be given in 2017-18

Summary

Provide the student with the skills and tools necessary for a wise and efficient orgqnization of his-her experimental work in all fields of materials science and technology (development, processing and caracterization of materials)

Content

Introduction:

- Experimental system; inputs and outputs; factors; treatments; tests; experience
- Optimization; problem solving

Refreshment of basic statistics:

- Descriptive statistics (statistical population, sampling, mean, standard deviation, standard distribution)
- Hypothesis testing (Type I and type II error risks)
- Statistical tests (Student's t-test, F- test, Khi-2 test)

Simple comparison designs:

- Comparing two data sets: differences between means, variance ratios
- Sensitivity and power: how many tests are required ?
- Randomization: how to prevent systematic effects of parasitic factors ?

Single factor designs:

- Statistical model
- Analysis of variance (ANOVA)
- Model adequacy checking (residuals analysis)
- Fully randomized vs randomized complete block designs
- Choice of sample size

Multifactorial designs:

- Main factor effects, interactions
- 2k factorial designs

- Single replica of multifactorial designs
- Partial multifactorial designs

Case studies:
- Building materials, metals and alloys, ceramics, composites
- Biomaterials (in vitro, in vivo and clinical experiments)

Note

Intensive one-week course. MS Excel spreadsheets used for practical work

Keywords

DOE, ANOVA, statistical analysis, experimental methodology

Learning Prerequisites

Recommended courses

Basic statistics and materials science, MS Excel

Assessment methods

Written and oral test

Resources

Bibliography

Reference book: D.C. Montgomery “Design and Analysis of Experiments” Wiley & Sons, NY.

Ressources en bibliothèque

- Design and Analysis of Experiments / Montgomery