MSE-629  
Design and analysis of experiments in materials science and engineering  
Lemaître Jacques

**Cursus**  
Science et génie des matériaux  
Sem.  
Type Obl.

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Science et génie des matériaux  
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**Language**  
English  
Credits 2

**Session**  
Exam Written  
Workload 60h  
Hours 28  
Lecture 14  
Practical work 14  
Number of positions 15

**Frequency**  
Every year

**Remarque**  
Postponed until further notice

**Summary**  
Provide the student with the skills and tools necessary for a wise and efficient organization of his/her experimental work in all fields of materials science and technology (development, processing and characterization 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)

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

Ressources en bibliothèque
• Design and Analysis of Experiments / Montgomery