UNIVERSITEIT GENT

Studiefiche

Vanaf academiejaar 2024-2025

Experimental Design (I001280)

Cursusomvang *(nominale waarden; effectieve waarden kunnen verschillen per opleiding)*

Studiepunten 3.0 **Studietijd 75 u**

Aanbodsessies en werkvormen in academiejaar 2024-2025

A (semester 2)	Engels	Gent	hoorcollege werkcollege
B (semester 2)	Engels	Gent	hoorcollege werkcollege zelfstandig werk

Lesgevers in academiejaar 2024-2025

Luca, Stijn	LA26	Verantwoordelijk lesgever
Meys, Joris	LA26	Medewerker

Aangeboden in onderstaande opleidingen in 2024-2025	stptn	aanbodsessie
Master of Science in Bioinformatics(afstudeerrichting Systems Biology)	3	A
Master of Science in Bioscience Engineering: Cell and Gene Biotechnology	3	A
Master of Science in Chemical Engineering	3	A
Master of Science in de bio-ingenieurswetenschappen: landbouwkunde	3	A
Master of Science in de bio-ingenieurswetenschappen: levensmiddelenwetenschappen en voeding	3	A
Master of Science in de bio-ingenieurswetenschappen: milieutechnologie	3	A
Master of Science in de ingenieurswetenschappen: chemische technologie	3	A
Master of Science in Statistical Data Analysis	5	B
Uitwisselingsprogramma bio-ingenieurswetenschappen: cel- en genbiotechnologie (niveau master-na-bachelor)	3	A
Uitwisselingsprogramma bio-ingenieurswetenschappen: chemie en bioprocestechnologie (niveau master-na-bachelor)	3	A
Uitwisselingsprogramma bio-ingenieurswetenschappen: Food Science and Nutrition (niveau master-na-bachelor)	3	A
Uitwisselingsprogramma bio-ingenieurswetenschappen: landbouwkunde (niveau master-na-bachelor)	3	A
Uitwisselingsprogramma bio-ingenieurswetenschappen: milieutechnologie (niveau master-na-bachelor)	3	A

Onderwijstalen

Engels

Trefwoorden

Statistics, experimental design, sampling, sample size calculation, optimal experimental design, factorial designs, response surface design, split-plot design.

Situering

The course content is closely related to the theory and practice of linear statistical models (e.g. regression analysis and analysis of variance) as taught in 'Statistical Data Processing'. Although the design phase of a study appears prior to the experimentation and statistical analysis phases, a design cannot be constructed without knowing how the data, that will arise from the designed study, will be analysed. A very good knowledge of the theory of linear statistical models is therefore very important.

The importance of experimental design for scientific and operational research is evident. A good design is necessary to make the statistical analysis of the data resulting from the experiment correctly interpretable. Moreover, efficiency in terms of cost versus precision may be considerably increased by choosing an appropriate design. The aim of this course in not only to teach students to design studies, but also more generally to broaden their understanding of the relation between experimenting and induction.

Inhoud

Offering session A:

- **General concepts:** sampling from a population, randomization, random sampling, stratified sampling, bias, confounding.
- **Sample size calculation:** exact methods, approximation methods using simulation, asymptotic approximation, adaptive designs and interim analysis.
- **Optimal experimental design:** methods based on the Fisher information matrix (e.g. A, D and E optimality), orthogonality of a design, designs for parameter estimation versus prediction, Fedorov algorithm, FDS-plots.
- **Factorial designs (designs for ANOVA):** screening designs, full and fractional factorial designs (aliasing and confounding), resolution of a design, replication, orthogonal designs.

Offering session B also includes:

- **Extended topics:** blocking in factorial designs, response surface design, split-plot designs.
- The content of **a scientific paper** related to the topics of the course.

Begincompetenties

Experimental Design builds on certain learning outcomes of the course unit Statistical Data Processing; or the learning outcomes have been achieved differently.

Eindcompetenties

1 Translate the study objectives into an appropriate design.
2 Assess the relation between the design and the statistical analysis method
3 Assess the properties of a design, its merits and its shortcommings
4 Assess the relation between the theory and the applications of “experimental design”
5 Analyze the design correctly.

Creditcontractvoorwaarde

Toelating tot dit opleidingsonderdeel via creditcontract is mogelijk mits gunstige beoordeling van de competenties

Examencontractvoorwaarde

Dit opleidingsonderdeel kan niet via examencontract gevolgd worden

Didactische werkvormen

Werkcollege, Hoorcollege, Zelfstandig werk

Studiemateriaal

Type: Syllabus

Naam: Experimental Design
Richtprijs: € 15
Optioneel: nee
Taal : Engels
Beschikbaar op Ufora : Ja
Online beschikbaar : Nee
Beschikbaar in de bibliotheek : Nee
Beschikbaar via studentenvereniging : Ja

Referenties

Montgomery, D., C. (2020). Design and Analysis of Experiments (10th ed.). John Wiley & Sons.
Goos, P. and Jones, B. (2011). Optimal design of experiments: a case study approach. John Wiley & Sons.
Cox, D. and Read, N. (2000). The theory of the design of experiments. Chapmann and Hall.

Vakinhoudelijke studiebegeleiding

In the practical sessions in the PC classes the students are coached by an assistent. Students can make an appointment to ask questions to the lecturer. Questions and answers can be exchanged in Ufora.

Evaluatiemomenten

periodegebonden evaluatie

Evaluatievormen bij periodegebonden evaluatie in de eerste examenperiode

Schriftelijke evaluatie open boek

Evaluatievormen bij periodegebonden evaluatie in de tweede examenperiode

Schriftelijke evaluatie open boek

Evaluatievormen bij niet-periodegebonden evaluatie

Tweede examenkans in geval van niet-periodegebonden evaluatie

Niet van toepassing

Toelichtingen bij de evaluatievormen

The periodical evaluation consists in a written open book examination with the use of R. As well insight in the theory as the application of the methods on practical problem settings will be evaluated.

Eindscoreberekening

Final exam only (100%)