Sveučilište u Zagrebu Agronomski fakultet
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Design of Experiments (296583)

Nositelj kolegija

prof. dr. sc. Jerko Gunjača

Opis kolegija

Comparative scientific studies are based on experiments, carried out in order to test the research hypothesis. Therefore, adequate planning, performing, and analysis of experimental data are prerequisite for the success of the scientific work. This module is conceived to enable students to get acquainted with basic terms in experimentation, and to introduce them to various types of experimental design. Furthermore, students will learn the basic principles of planning and analysis of experimental data, as well as specifics of specialized designs. Particular emphasis will be given on the choice of the appropriate design, one that should adequately accommodate research hypothesis, enable the most efficient statistical analysis for the most informative interpretation of the results.
Prerequisite for successful following of the courses is proficiency in statistical methods included in a basic statistics course: t-test, analysis of variance, regression.

ECTS: **3.00**

E-učenje: **R1**

Sati nastave: 30
Predavanja: 15
Vježbe u praktikumu: 10
Seminar: 4
Terenske vježbe: 1

Izvođač predavanja

- prof. dr. sc. Jerko Gunjača

Izvođač vježbi

- prof. dr. sc. Jerko Gunjača
- izv. prof. dr. sc. Toni Safner
- doc. dr. sc. Miroslav Bukan

Izvođač seminara

- prof. dr. sc. Jerko Gunjača

Ocjenjivanje

Dovoljan (2): 60-69 %
Dobar (3): 70-79 %
Vrlo dobar (4): 80-89 %
Izvrstan (5): 90-100%

Vrsta kolegija

- Graduate studies / MS Courses taught in English (Izborni kolegij, 2. semestar, 1. godina)

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Opće kompetencije

Students receive the necessary theoretical and practical knowledge about the design of experiments.

Oblici nastave

- Lectures
  Designed to provide necessary theoretical background.
- Practicum
  The tutorials consist of a statistical analysis of the examples using the software package R, and interpretation of the results. They are conducted in groups of 10-15 students.
- Field work
  Visit to the field trials of the Department of Plant Breeding, Genetics and Biometrics.
- Seminars
  Three "case studies" - a description, statistical analysis and interpretation of results in the form of scientific paper.

Ishodi učenja i način provjere

Ishod učenja	Način provjere
understand the basic principles of experimentation,	written exam
describe the various characteristics of the most commonly used experimental plans,	written exam
select the optimal design for the planning of experiments,	seminars
analyze the collected data using an appropriate model for the statistical analysis of experimental data,	seminars
present and interpret the results of statistical data analysis,	seminars
compare the efficiency of different designs,	seminars, written exam
recommend the optimal design and appropriate statistical model suited to the given objectives of research	seminars, written exam

Način rada

Obveze nastavnika

All teaching materials are organized and to complement appropriate teaching units. They are ready to became available through the Merlin – the system for e-learning, which includes forum for communication with students, calendar of major events, information related to the course, on-course assignments, instructions for the use of teaching materials, evaluation methods for seminars and written examinations.

Obveze studenta

Attending lectures, tutorials and seminars is required, and the students should participate in e-learning. It is expected that the students will be able to log into the Merlin system for e-learning Merlin during the first two weeks of classes, and use it to get access to lecture presentations, examples of solved problems from seminars and other materials. Prerequisite for the final exam is regular attending to lectures and tutorials, as well as the successful completion of seminars.

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Polaganje ispita

Elementi praćenja	Maksimalno bodova ili udio u ocjeni	Bodovna skala ocjena	Ocjena	Broj sati izravne nastave	Ukupni broj sati rada prosječnog studenta	ECTS bodovi
Attending lectures and tutorials		<60 60-70 71-80 81-90 91-100	Nedovoljan (1) Dovoljan (2) Dobar (3) Vrlo dobar (4) Izvrstan (5)	26	26	0,9
Seminar 1 (S1)	16%	<60 60-70 71-80 81-90 91-100	Nedovoljan (1) Dovoljan (2) Dobar (3) Vrlo dobar (4) Izvrstan (5)	1	10	0.3
Seminar 2 (S2)	17%	<60 60-70 71-80 81-90 91-100	Nedovoljan (1) Dovoljan (2) Dobar (3) Vrlo dobar (4) Izvrstan (5)	1	10	0.3
Seminar 3 (S3)	17%	0-59 60-69 70-79 80-89 90-100	Nedovoljan (1) Dovoljan (2) Dobar (3) Vrlo dobar (4) Izvrstan (5)	1	10	0.3
Written exam (WE)	50%	0-59 60-69 70-79 80-89 90-100	Nedovoljan (1) Dovoljan (2) Dobar (3) Vrlo dobar (4) Izvrstan (5)	1	34	1,2
Total	100	((S1+S2+S3)/3+ WE)/2		30	90	3

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Tjedni plan nastave

1. Introduction to experimentation - Principles of experimentation; introduction to basic terms in experimentation – treatments, plots, replication, randomization.
2. Introduction to experimentation - Linear models, least squares, treatment comparisons/multiple comparisons, residuals. Introduction to R – software environment for statistical computing.
3. Introduction to experimentation - Model building in R. Visit to experimental field of Department of Plant Breeding, Genetics and Biometrics.
4. Multifactorial experiments - Analysis of multifactorial experiments – treatment structure, factors, levels, additivity, interaction, fixed and random effects, hierarchical and crossclassified designs.
5. Multifactorial experiments - Modelling in R
6. Complete block designs - Design structure, blocks/replicates, experimental error control, design efficiency – completely randomized design, randomized complete block design
7. Complete block designs - Modelling in R
8. Complete block designs - Latinized designs – Latin square
9. Complete block designs - Modelling in R – "case study"
10. Incomplete block designs - Block size, experimental error control, treatment comparisons, recovery of inter-block information, design efficiency – alpha design, row-column design.
11. Incomplete block designs - Modelling in R
12. Split-plot designs - Unequal plot size, multiple errors, treatment comparisons, multifactorial designs – split-plot
13. Split-plot designs P - Modelling in R
14. Some advanced designs - Repeated measures, analysis of covariance, «crossover» design
15. Exam

Obvezna literatura

1. Kuehl, R.O., 2000. Design of Experiments. Duxbury, Pacific Grove

Preporučena literatura

1. Gomez, KA, and Gomez, AA, 1984. Statistical Procedures for Agricultural Research. John Wiley & Sons

Sličan kolegij na srodnim sveučilištima

- Experimental Design, BOKU
- Advanced Statistics course: Design of Experiments, Wageningen UR
- Experimental Trials in Agriculture, University of Hohenheim
- Linear mixed models and experimental design with applications to agricultural field experiments, Swedish University of Agricultural Sciences

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