Course (NH02005): EXPERIMENTAL METHODS

1. General information

- Term: 4
- Credits: **Total credits 2 (Lecture: 1.5 – Practice: 0.5)**
- **Self-study: 6** credits
- Credit hours for teaching and learning activities: 30 hrs
- Self-study: 90 hrs.
- Department conducting the course:
  - Department: Experimental Methods and Biostatistics
  - Faculty: Faculty of Agronomy
- Kind of the course:

Foundation □		Fundamental □		Option 1 □		Option 2 □	
Compulsory □	Elective □	Compulsory □	Elective □	Compulsory □	Elective □	Compulsory □	Elective □

- Prerequisite course(s): None

2. Course objectives and expected learning outcomes

- Knowledge: Course provides for students with knowledge in experimental methods, conducting experiments in specific condition and applying statistics to publish search results
- Skills: Course provides students with skills in in processing, statistical analysis, and presentation of experimental results
- Attitude: Course provides students with attitudes in serious learning and willingness to learn for life.

**** Course expected learning outcomes***

Notation	**Course expected learning outcomes** After successfully completing this course, students are able to	**PLO performance criteria**
Knowledge		
CELO1	Apply correctly knowledge of experimental methods and biostatistics in the field of horticulture and landscape design	1.1 (R)
Skills		
CELO2	Select the appropriate statistical software to process the research results	6.2 (P)
CELO3	Present the reasonable conclusions based on statistically processed results.	6.4 (P)
Attitude		
CELO4	Establish the willingness to self-study to improve professional level	10.2 (P)

3. Course description

This course consists of 9 chapters, dealing with the following issues: Introduction to scientific research in agriculture; Experimental design; Conduct the field experiments; Summarize obtained data; Estimation; Statistical hypothesis testing; Analysis of variance; Regression correlation analysis; Summarize the experiments.

4. Teaching and learning & assessment methods

CELOs	CELO1	CELO2	CELO3	CELO4
Teaching and learning				
Lecturing	x			x
Teaching through practical work		x	x	x
Assessment				
Rubric 1. Class attendance (2 %)				x
Rubric 2. Mid-term exam (4 %)	x			
Rubric 3. Homework (4 %)	x			
Rubric 4. Practice attitude (6 %)				x
Rubric 5. Practice exam (24 %)		x	x	
Rubric 6. Final exam (60 %)	x			

5. Student tasks

- Attendance: All students must attend at least 75 % of the theory sessions.
- Preparation for the lecture: All students must read the lesson in advance at the request of the teacher.
- Homework: All students must spend time on self-study to do exercises at the end of each chapter in the textbook as well as conduct nine exercises requested by lecturer and submit to the lecturer.
- Mid-term exam: All students must take a mid-term exam.
- Practice: All students must participate fully and on time the practice sessions.
- Practice exam: The result of the practice exam must be at least 5 points or higher (on a 10-point scale).
- Final exam: All students must take the final exam according to university's calendar

6. Text books and references

**** Text Books/Lecture Notes:***

1. Do Thi Huong. (2021). Lectures of Experimental Methods
2. Nguyen Thi Lan & Pham Tien Dzung. (2006). Textbook of Experimental Methods. Vietnam National University of Agriculture Pulisher.

**** Additional references:***

1. Pham Tien Dzung và Nguyen Đinh Hien .(2010). Hanbook of experimental design and data analyzing by IRRISTAT statistics software. Financial Publisher.
2. Đo Thi Huong, Phan Thi Thuy. (2021). STAR software application in analyzing agricultural research results. Vietnam National University of Agriculture Pulisher.
4. Roger Mead, Robert N. (2017). Statistical methods in Agriculture and Experimental biology. Curnow and Anne M. Hasted. Nhà xuất bản A CRC Press Company.

7. Course outline

Week	Content	Course expected learning outcomes
1	***Chapter 1: Introduction to scientific research in agriculture***	
	A/* Main contents: *(3 hours)* **Theories:** *(3 hours)* 1.1. Definition, role and property of scientific research 1.2. The process of scientific research in agriculture	CELO1, 4

	1.3. Types of agricultural experiments	
	***B/* Self-study contents**: *(9 hours)* 1.1. Find out references on scientific research methods 1.2. Find out references on experimental methods in agriculture	CELO1, 4
2,3	***Chapter 2: Experimental design***	
	A/* Main contents: (6 hours)* **Theories:** *(6 hours)* 2.1. The mandatory requirements of field experiments 2.2. Types of field experiments 2.3. Experimental design 2.4. Construct the research proposal	CELO1, 4
	***B/* Self-study contents**: *(18 hours)* Learn more about experimental set-up methods	CELO1, 4
4	***Chapter 3: Conduct the field experiments***	
	A/* Main contents: (2.5 hours)* **Theories:** *(1.5 hours)* 3.1. Prepare soil and divide the experimental plots 3.2. Fertilization and cultivation 3.3. Observe the experiment and sampling 3.4. Harvesting the experiment **Practice:** *(1 hour)* Experimenting on the field	CELO1, 4
	***B/* Self-study contents**: *(7.5 hours)* - Calculate the amount of seeds needed for some crops - Refer to the documentation on how to sample some crops	CELO1, 4
4	***Chapter 4: Summarize experimental data***	
	A/* Main contents: (3.5hours)* **Theories:** *(1.5 hours)* 4.1. Edit data 4.2. Classify data 4.3. Check out the suspect data 4.4. Arrange data 4.5. Descriptive statistics parameters 4.6. Some rules about rounding numbers in calculations **Practice:** *(2 hour)* - Calculate the descriptive statistics parameters - Making a histogram using the frequency distribution table	CELO1, 2, 4
	***B/* Self-study contents**: *(10.5 hours)* - Conduct the exercises in the chapter 4 of textbook - Review the practice content	CELO1, 2, 4
5	***Chapter 5: Estimation***	
	A/* Main contents: (1.5 hours)* **Theories:** *(1.5 hours)* 5.1. Definition 5.2. Estimation of a population mean 5.3. Estimation of a population proportion	CELO1, 4

	***B/* Self-study contents**: *(4.5 hours)* Conduct the exercises in the chapter 5 of textbook	CELO1, 4
5	***Chapter 6: Statistical hypothesis testing***	
	A/* Main contents: (3.5 hours)* **Theories:** *(1.5 hours)* 6.1. Definitions 6.2. Hypothesis testing for two independent samples 6.3. Hypothesis testing for two dependent samples 6.4. Independence test (testing the homogeneity of samples) 6.5. Hypothesis testing for population variances **Practice:** *(2 hour)* - Hypothesis testing for polulation means (independent samples and large sample size) - Hypothesis testing for polulation means (independent samples and small sample size) - Hypothesis testing for polulation means (paired samples)	CELO1, 2,3,4
	***B/* Self-study contents**: *(10.5 hours)* - Conduct the exercises in the chapter 6 of textbook - Review the practice content	CELO1, 2,3,4
6,7	***Chapter 7: Analysis of variance***	
	A/* Main contents: (7 hours)* **Theories:** *(4 hours)* 7.1. One-factor experiments 7.2. Notes before conducting analysis of variance **Practice:** *(3 hour)* - Analysis of variance for Completely Randomized Design (CRD) - Analysis of variance for Randomized Complete Block Design (RCB) - Analysis of variance for Latin Square Design (LS)	CELO1, 2,3,4
	***B/* Self-study contents**: *(21 hours)* - Conduct the exercises in the chapter 7 of textbook - Review the practice content	CELO1, 2,3,4
7	***Chapter 8: Correlation and regression analysis***	
	A/* Main contents: (2 hours)* **Theories:** *(2 hours)* 8.1. Definitions 8.2. Simple linear regression	CELO1, 4
	***B/* Self-study contents**: *(6 hours)* Conduct the exercises in the chapter 8 of textbook	CELO1, 4
8	***Chapter 9: Summarize the experiments data***	
	A/* Main contents: (1 hours)* **Theories:** *(1 hours)* 9.1. Present data in scientific reports 9.2. Summarizing and writing reports	CELO1, 4
	***B/* Self-study contents**: *(3 hours)* Find out references on how to present data and write scientific reports.	CELO1, 4