FDMRI
Sveučilište u Rijeci • Fakultet dentalne medicine
University of Rijeka • Faculty of Dental Medicine

Course: Statistics
Course Coordinator: Diana Mance, PhD, Assistant Professor
Department: Faculty of Physics, University of Rijeka
Study program: Integrated Undergraduate and Graduate University Study of Dental Medicine in English
Study year: second
Academic year: 2022/23

SYLLABUS

Course description (a brief description of the course, general instructions, where and in what form the lessons are organized, necessary equipment, instructions for attendance and preparation for classes, student obligations, etc.):

The Statistics course is taught from 28.02.2023. to 10.03.2023. in the second year of University Study of Dental Medicine and consists of 15 hours of lectures and 15 hours of exercises (2 ECTS).

The course is held in the lecture hall O-130 of the University of Rijeka's Faculty of Physics (FOP) (Campus Trsat, Ulica Radmile Matejčić 2).

The course's goal is to prepare students for research design as well as data organization and processing in medicine and health care. Throughout the course, students will learn about data systematization and graphical representation. The fundamentals of descriptive and inferential statistics are covered in this course. Students learn how to perform parametric and non-parametric tests, interpret statistical test results, and present statistical analysis results by using the statistics program. The knowledge and skills gained in the course are required for critical reading of scientific and professional literature, as well as the preparation of professional and scientific materials and decision making in biomedical and health care settings.

Students' responsibilities include regular attendance and active participation in class. The professor monitors the students' active participation in the execution of the exercises. Three homework assignments and two midterm exams are used to continuously assess students' knowledge. Participation in the final examination is contingent on the completion of all assigned homework and midterm exams.

Assigned reading:

Triola MM, Triola MF. Biostatistics for the Biological and Health Sciences. Pearson, 2018.

Optional/additional reading:

Dawson B, Trapp R.G, „Basic & Clinical Biostatistics“, McGraw-Hill, 5ed., 2020. (e-book)
https://accessmedicine.mhmedical.com/Book.aspx?bookid=2724
Boris Petz, Vladimir Kolesarić, Dragutin Ivanec: Petzova statistika, Naklada Slap, Jastrebarsko, 2012 (in croatian)

COURSE TEACHING PLAN:

The list of lectures (with topics and descriptions):

L1 Introduction. Applied statistics in biomedicine and health care.
Expected Learning Outcomes
Give examples of the application of statistics in biomedicine and health care.
Describe the course of the research process.

Distinguish between descriptive and inferential statistics.
Distinguish between sample and population.
Apply the process of generalization about the population based on sample analysis.

L2 Graphical and tabular presentation of data.
Expected Learning Outcomes
List the types of data and measurement scales and give examples of each.
Distinguish between types of statistical tables and graphical representations of data.
Represent data using tables and graphs.

L3 Normal distribution. Z-score.
Expected Learning Outcomes
Distinguish between data distributions.
Describe the normal distribution of data.
Define the properties of the normal distribution.
Establish the null hypothesis.
Determine the position of a single outcome in a normal distribution using the z-score.
Distinguish between parametric and non-parametric statistical tests.

L4 Measures of central tendency and variability.
Expected Learning Outcomes
List measures of central tendency and measures of data variability.
Describe a boxplot.
Select an appropriate measure of central tendency and an appropriate measure of data variability depending on the distribution of the data.

L5 Correlation and linear regression.
Expected Learning Outcomes
Recognize in which cases it is useful to calculate Pearson correlation coefficient.
Distinguish between complete and incomplete correlation.
Distinguish between positive and negative correlation.
Calculating the Pearson correlation coefficient, determining its statistical significance and interpreting its meaning.
Calculating and explaining the coefficient of determination.
Describe and apply a simple linear regression model.
Determine the equation of the regression line.
Explain the 95% confidence interval.

L6 T-test for independent samples.
Expected Learning Outcomes
Distinguish between dependent and independent samples.
Describe the procedure for performing a t-test.
State the appropriate null hypothesis.
Apply the t-test to test the difference in arithmetic means for two independent samples.

L7 T-test for dependent samples.
Expected Learning Outcomes
Distinguish between dependent and independent data.
Describe the procedure for performing a t-test for dependent samples.
State the null hypothesis.
Apply the t-test to test the difference in arithmetic means for two dependent samples.

L8 Introduction to non-parametric tests.
Expected Learning Outcomes
Distinguish between cases where statistical analysis is performed using parametric tests and cases where non-parametric statistical tests are used for analysis.
Calculate proportions and the standard error of proportions.
Compare qualitative data using the chi-square test.

Comparison of qualitative data using the McNemar test.
L9 One-way analysis of variance (ANOVA).
Expected Learning Outcomes
Recognize instances where ANOVA can be used for statistical analysis.
Distinguish between and within groups variation.
Perform statistical tests using ANOVA.
Perform post-hoc analysis.
Interpret the results of the statistical analysis.
Present the results of the statistical analysis.

L10 Review and the first midterm exam.
Expected Learning Outcomes
Perform appropriate statistical analysis.
Interpret the results of statistical analysis.
Draw conclusions based on the statistical analysis performed.

L11 Final Lecture
Expected Learning Outcomes
Systematization of course material.

The list of practicals with descriptions:

P1 Graphical and tabular presentation of data.
Expected Learning Outcomes
Become familiar with the basics of using software support for statistical data analysis.
Prepare and enter/load data into a computer program.
Graphically represent data using an Excel spreadsheet and appropriate statistical program.

P2 Normality of distribution. Z-score.
Expected Learning Outcomes
Test the normality of the distribution.
Determine the position of an individual result in a group of normally distributed data.

P3 Measures of central tendency and variability.
Expected Learning Outcomes
Recognize and calculate the appropriate measure of central tendency and measure of variability for given data.
Compute and interpret individual measures of central tendency and measures of data variability.

P4 Correlation and linear regression.
Expected Learning Outcomes
Calculate the correlation coefficient using a statistical program.
Determine the statistical significance of the correlation coefficient and interpret its meaning.
Determine the equation of the regression line.
Draw a scatter plot and a regression line in a computer program.
Edit the graph in a computer program.

P5 T-test for independent samples.
*Expected Learning Ou*tcomes
Recognize situations in which the t-test for independent samples can be used.
State the appropriate null hypothesis.
Use a statistical program to perform a t-test for independent samples.
Interpret the results of the t-test.

P6 T-test for dependent samples.
Expected Learning Outcomes
Recognize situations in which the t-test for dependent samples can be used.
State the appropriate null hypothesis.

Use a statistical program to perform a t-test for dependent samples.
Interpret the results of the t-test.

P7 Introduction to non-parametric testing.
Expected Learning Outcomes
Recognize when to use the chi-2 test and when to use the McNemar test for statistical analysis.
Explain and perform the chi-2 test procedure for one sample, multiple independent samples, and two dependent samples (McNemar test).
Perform chi-2 testing for one sample, multiple independent samples, and two dependent samples (McNemar test) and Fisher's exact test in the appropriate statistical program.

P8 One-way analysis of variance (ANOVA).
Expected Learning Outcomes
Perform ANOVA using a statistical program.
Perform a post-hoc analysis using a statistical program.
Interpret the results of the statistical analysis performed.
Present the results of the statistical analysis.

P9 Repetition and second midterm exam
Expected Learning Outcomes
Use a statistical program to perform appropriate statistical analysis.
Interpret the results of statistical analysis.
Draw conclusions based on the statistical analysis performed.

Students' obligations:

Students must attend class on a regular basis and actively participate in all parts of the course.
Only students who have completed all of their assignments and passed both midterm exams are eligible to take the final exam.

Assessment (exams, description of written / oral / practical exam, the scoring criteria):

During class, the following performances will be assessed (maximum 70 points):
a) 3 homework assignments (1 point each, up to 3 points);
b) 1st midterm exam (written, up to 35 points); and
c) 2nd midterm exam (using a computer program, up to 32 points).

Of the maximum 70 points that can be earned in class, a minimum of 37 points must be earned to be eligible to take the final exam (all 3 assignments, 18 points for the first midterm and 16 points for the second midterm). Students who score less than 37 points will have the opportunity to retake the midterm exam once. Students who score less than 37 points during the class will receive a grade of F (fail) and must re-enrol in the course.

	Assessment	**Grade Point Maximum**
Midterm Exams	Midterm 1	35
	Midterm 2	32
Homework assignments	3 homeworks (1 point each) 3 x 1	3
FINAL EXAM	Written	30
TOTAL POINTS		**100**

A maximum of 30% of classes may be missed, and only for health reasons justified by a doctor's excuse. Attendance at lectures and exercises is mandatory.
If a student, excused or unexcused, misses more than 30% of classes, he/she will not be able to continue the course and will lose the possibility to take the final exam. He/she will thus have accumulated 0 ECTS points and will be graded F.

First midterm exam (up to 35 points)
The first midterm exam consists of 3 tasks covering the material covered in the lectures. Students are expected to demonstrate the ability to identify problems, select an appropriate statistical test, perform a statistical analysis, and interpret the results obtained. Each assignment will be graded separately. The maximum possible score is 35 points, and the minimum score to pass the exam is 18 points.

Second midterm exam (up to 32 points)
The second midterm exam consists of 3 assignments covering the material covered in the exercises. The tasks are solved with the help of a statistics program. Students will demonstrate the ability to identify problems, use a statistical program, perform appropriate statistical analysis, and interpret the results obtained. Each assignment will be graded separately. The maximum possible score is 32 points, and the minimum score to pass is 16 points.

Homeworks (up to 3 points)
The three homework assignments will relate to the material covered in the exercises. Students are expected to solve the assignments using a statistical program. Each completed homework assignment equals to 1 point. Homework assignments are obligatory.

Final exam (up to 30 points)
The student will take the final exam after completing the course and earning at least 37 points during the course (3 assignments, 18 points for the first midterm, and 16 points for the second midterm). The final exam is a written exam with 30 multiple-choice questions. 1 point is awarded for each question answered correctly. The exam is considered passed if at least 15 points have been achieved.

The total of the points (percentages) earned in class and on the final exam constitutes the final grade.
The table below depicts the grading system.

Points (%)	Grade	ECTS
90 - 100%	5	A
75 – 89.9%	4	B
60 – 74.9%	3	C
50 – 59.9%	2	D

COURSE SCHEDULE (for academic year 2022/2023)

Date	Lectures (time and place)	Practicals (time and place)	Instructor
28/2/2023	L1,2 (9:00-10:30) O-130 / Faculty of Physics	P1 (11:00-12:30) O-130 / Faculty of Physics	Diana Mance
1/3/2023	L3,4 (9:00-10:30) O-130 / Faculty of Physics	P2,3 (11:00-12:30) O-130 / Faculty of Physics	Diana Mance
2/3/2023	L5 (9:00-10:30)		Diana Mance

	O-130 / Faculty of Physics	P4 (11:00-12:30) O-130 / Faculty of Physics	
3/3/2023	L6,7 (9:00-10:30) O-130 / Faculty of Physics	P5,6 (11:00-12:30) O-130 / Faculty of Physics	Diana Mance
6/3/2023	L8 (9:00-10:30) O-130 / Faculty of Physics	P7 (11:00-12:30) O-130 / Faculty of Physics	Diana Mance
7/3/2023	L9 (9:00-11:30) O-130 / Faculty of Physics	P8 (12:00-13:30) O-130 / Faculty of Physics	Diana Mance
8/3/2023	L10,11 (9:00-11:00) O-130 / Faculty of Physics		Diana Mance
9/3/2023		P9 (9:00-12:00) O-130 / Faculty of Physics	Diana Mance
10/3/2023	FINAL EXAM (9:00-11:00) O-130 / Faculty of Physics		Diana Mance

List of lectures and seminars:

	LECTURES (Topics)	Teaching hours	Location/Lecture room
L1	Introduction. Applied statistics in biomedicine and health care.	1	Faculty of Physics/O-130
L2	Graphical and tabular presentation of data.	1	Faculty of Physics/O-130
L3	Normal distribution. Z-score.	1	Faculty of Physics/O-130
L4	Measures of central tendency and variability.	1	Faculty of Physics/O-130
L5	Correlation and linear regression.	2	Faculty of Physics/O-130
L6	T-test for independent samples.	1	Faculty of Physics/O-130
L7	T-test for dependent samples.	1	Faculty of Physics/O-130
L8	Introduction to non-parametric tests.	2	Faculty of Physics/O-130
L9	One-way analysis of variance (ANOVA).	2	Faculty of Physics/O-130
L10	Review and the first midterm exam.	2	Faculty of Physics/O-130
L11	Final lecture	1	Faculty of Physics/O-130
	TOTAL TEACHING HOURS	**15**	

	PRACTICALS (Topics)	Teaching hours	Location/Lecture room
P1	Graphical and tabular presentation of data.	2	Faculty of Physics/O-130
P2	Normality of distribution. Z-score.	1	Faculty of Physics/O-130

P3	Measures of central tendency and variability.	1	Faculty of Physics/O-130
P4	Correlation and linear regression.	2	Faculty of Physics/O-130
P5	T-test for independent samples.	1	Faculty of Physics/O-130
P6	T-test for dependent samples.	1	Faculty of Physics/O-130
P7	Introduction to non-parametric testing.	2	Faculty of Physics/O-130
P8	One-way analysis of variance (ANOVA).	2	Faculty of Physics/O-130
P9	Repetition and second midterm exam.	3	Faculty of Physics/O-130
	TOTAL TEACHING HOURS	**15**	

	FINAL EXAM DATES
1.	10.03.2023.
2.	05.7.2023.
3.	19.7.2023.
4.	04.9.2023.
5.	19.9.2023.