



UNIVERSITÀ DI PAVIA

Anno Accademico 2021/2022

STATISTICS (SURNAMES A-K)	
Enrollment year	2021/2022
Academic year	2021/2022
Regulations	DM270
Academic discipline	MAT/06 ()
Department	DEPARTMENT OF BIOLOGY AND BIOTECHNOLOGY "LAZZARO SPALLANZANI"
Course	BIOTECHNOLOGY
Curriculum	PERCORSO COMUNE
Year of study	1°
Period	
ECTS	6
Lesson hours	48 lesson hours
Language	Italian
Activity type	
Teacher	ORRIERI CARLO - 6 ECTS
Prerequisites	This is the second part of the course "Calculus and Statistics". Mathematical topics studied in the first semester in the "Calculus" part of the course are the prerequisites for the second part. "Calculus" part of the course
Learning outcomes	The course aims to introduce students to statistical data analysis. It is intended to provide basic knowledge of descriptive and inferential statistics. Part of the course will be devoted to the study of the basic tools and the probabilistic mathematical language. At the end of the course the student will be able to understand and interpret basic statistical analyses and should also be aware of the limits of the information obtained from the data.
Course contents	Part I: descriptive statistics. ?

Data, populations and samples. Frequencies, percentages, histograms. Empirical mean, median, mode, quantiles, variance, standard deviation. Correlation coefficient (Pearson), scatter plots.

Part II: probability.

Definition of probability, elements of combinatorics, conditional probability, independence, Bayes's formula. ?Applications to clinical tests and genetics. ?Discrete random variable: density and distribution function. Mean and variance. Binomial and Poisson distributions. ?Random discrete vectors: joint density and independence. ??Continuous random variables. Uniform, exponential and Gaussian (or normal) distributions. Density function, mean and variance. Independence. Properties of Gaussian random variables. ?Chebychev's inequality and law of large numbers. Central limit theorem and some applications.??

Part III: statistical inference. ?

Random variables associated to a population. Point estimation and confidence interval. Sample mean ?random variable and sample standard deviation random variable. Confidence interval for the mean. Use of Student's t random variable. Confidence interval for a proportion. ???Hypothesis test for the mean. Null hypothesis. z-test and t-test. p-value. Hypothesis test comparing means ?of different populations. Chi-square test goodness of a fit. Chi-square test of independence. p-value. ?? Linear regression. Confidence interval for the regression coefficient in a linear model. Hypothesis test for the regression coefficient.

Teaching methods

Lectures and sessions of practical exercises aimed at applying in concrete examples the theoretical concepts presented during the lectures.

Recommened or required readings

Lectures Notes by the teachers

B. Rosner, Fundamentals of Biostatistics - 7th edition, Brooks/Cole Publishing, 2010.

Marco Abate, Matematica e Statistica. III edizione. Mc Graw Hill ed., 2017

Assessment methods

Being this the second part of the course ``Calculus and Statistics'', in order to be admitted to the examination, it is mandatory that the student have successfully passed the exam of the ``Calculus" part.

There will be a written examination, where the student will be asked to solve some problems on the specific topics treated during the course. If the student is positively evaluated in the written examination, at discretion of the commission or at the request of the student an additional oral colloquium can be considered.

Note that the final grade of ``Calculus and Statistics" course will be the mean of the grades of the two parts.

This is the second part of the course ``Calculus and Statistics"

