

# Course Guide 33801 Statistics

# COURSE DATAData SubjectCode33801NameStatisticsCycleGradeECTS Credits6.0Academic year2023 - 2024

Study (s)		
Degree	Center	Acad. Period year
1318 - Degree in Geography and the Environment	Faculty of Geography and History	2 First term
Subject-matter		
Degree	Subject-matter	Character
1318 - Degree in Geography and the Environment	622 - Statistics	Basic Training
Coordination		
Name	Department	
SERRANO LARA, JOSE JAVIER	195 - Geography	

# SUMMARY

The subject transmits to the student the basic concepts of statistics applied to geographic problems so that they understand its foundations and can, therefore, decide the techniques that best suit specific problems and thus be able to continue learning. Autonomous expanding knowledge on the subject.

The student must select and apply the most convenient statistical methods for the analysis of geographic information. In addition, she must use, understand and interpret the usual statistical software. Geographic information and its sources. Descriptive statistics and construction of indicators. Statistical inference. The normal distribution. Work with samples. Hypothesis contrast. Comparisons, relations and regressions.



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# **PREVIOUS KNOWLEDGE**

#### Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

#### **Other requirements**

It is convenient to have some experience in handling the Excel spreadsheet (tables, formulas and graphs) to carry out the practices.

Since the Virtual Classroom will be used as the main element of permanent communication outside the classroom between the teacher and the students, it will be necessary to know how to use it.

# OUTCOMES

### 1318 - Degree in Geography and the Environment

- Have capacity for analysis and synthesis.
- Have oral and written communication skills in one's own language and in a foreign language.
- Be able to work independently.
- Be able to work in interdisciplinary teams.
- Show commitment to the values of gender equality, interculturality, equal opportunities, universal access for people with disabilities, the culture of peace, democratic values and solidarity.
- Be able to learn independently and show creativity, initiative and entrepreneurship. Be able to resolve unforeseen situations.
- Show motivation for quality, responsibility and intellectual honesty.
- Be able to produce statistical information. Know how to use statistical software.
- Be able to communicate effectively with non-experts.
- Learn about geographical history and thinking.
- Learn about the time and space dimensions in the explanation of social, territorial and environmental processes.

## LEARNING OUTCOMES

- To interpret the statistical descriptive information, so much numerical as graph

- To know the different statistical basic technologies to be capable of choosing those that answer better to the raised problem



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- To present information using the most suitable tools of descriptive statistics

- To know the basic notions of probability to understand the methods of sampling and the statistics inferencial

- To use the procedures of the statistics inferencial to estimate the relation or not between variables.
- To know the usefulness of the multivariable analysis to answer to geographical diverse problems

# **DESCRIPTION OF CONTENTS**

## 1. Statistics in geography: positive feedback.

The content begins to try to answer what statistics is through its definition as:

The methodology used in studies that collects, organizes and summarizes data through graphical and numerical methods. Analyze the data and, finally, draw conclusions

A short journey is made from the origin of statistics, as part of the administration of empires, to the present, as one of the sciences that is taught in almost all scientific fields. In addition, the five purposes of statistics are listed, explained, and exemplified.

It continues with the differentiation between the branches of descriptive and inferential statistics, to give way to the application of statistics to the scientific method and how geography is also linked to it. This is one of the most important parts of the topic and in which each of the processes is detailed, explained, since it is essential in any research process within the geographic discipline. In addition, the students will apply it. This section cannot be finished without knowing and defining two key and necessary concepts for Topic 2, the concept of population (P) and that of sample. To do this, a graphic representation is used that helps their understanding and is also useful for the subsequent calculation of the sample worked on in Unit 2.

It continues with the role of statistics within Geography, in any of the three areas that make it up, and answers Why is statistics important in Geography? The difference between number and data is deepened and the 6W is explained. It continues with the different types of data classification that exist depending on their collection and, finally, the importance of metadata as a quality source of data in statistics.

# 2. Basic principles of statistics: from the organization and representation of data to sampling and calculation of samples.

Once the relationship between Statistics and Geography has been established and the scientific method has been introduced as a basic form of scientific work it is necessary to start this process. Doing research can be fascinating, but it should always be a systematic and planned process. For this, it is useful to advance in three basic principles that are key at the beginning of any research process.



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The first starting point of any investigation is knowing how to clearly identify a problem and, after that, define the VARIABLES involved. These variables are the fundamental piece and are each one of the properties, characteristics or qualities that a population and/or sample possess and are recorded. It is necessary that these variables exist so that data can subsequently be obtained and Descriptive, Inferential and/or Spatial Statistics techniques can be applied. However, each technique will depend on the type of measurement of the variables.

The second starting point to be able to apply any statistical technique is the ORGANIZATION AND THE SUMMARY, that is, it is necessary that the information is refined and intelligible. All this is achieved through frequency distributions, one of the most basic and relevant techniques prior to the analysis of any data. Attached to this are the graphic REPRESENTATION techniques that serve to reduce and represent the information of a study or investigation.

The third basic principle is to be able to achieve the greatest possible representativeness from a SAMPLE. For this, it is necessary to make essential decisions both in the type of SAMPLING for data collection and the number of sample units so that it is significant, and the results can be extrapolated to those of a population.

These three principles are essential for the start of any research process to be carried out correctly and without errors. Any failure - in any of these elements - would mean significant loss of information, time, money or even the entire invest

## 3. Descriptive statistics: measures of position, dispersion, shape and concentration.

In the previous topics it has been possible to verify the relationship between Geography and Statistics, the importance of the variables or understanding the scientific method, among others. This long road in the study of data, which we have begun, has begun with the collection of information (data) that the variables of any study (data) take. The next step has been to organize and summarize all that information. In order to understand and interpret these data, the first step is to make a frequency distribution (analyzed in the previous topic), which are integrated into spatial statistics and allow a large number of information and data to be synthesized in a table.

With the synthesis and distribution of the data, it is necessary to continue with the following process, the descriptive analysis of the same, that is, the descriptive statistics. For this, it is necessary to be able to apply a set of statistical parameters that allow the information contained to be summarized. These indices offer numerical values that synthesize and reflect different characteristics of a frequency distribution, such as: position, dispersion, shape and concentration. With these main measures, its results allow the description of the data, although without drawing conclusions (inferring) about the population to which it belongs.

Descriptive statistics, considered as the basic component of statistics, is applicable to almost all areas where quantitative (but also qualitative) data is collected. It can offer information about products, processes or various aspects, with the aim of: summarizing the measurements, describing the behavior of some parameter, characterizing, processing data, illustrating the measurement of the data and visualizing the result through graphs.



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In short, this new stage of research, descriptive statistics, should help to understand the structure, characteristics and behavior of the data.

## 4. Inferential statistics: probability, relations and significance.

Inferential statistics is a type of reasoning that proceeds from the concentrated to the general. For this, it is necessary to support this process in the correct design of the research, such as, for example, data collection, organization and summary, and the application of statistics that describe the data. All of this supposes the basis prior to inferential statistics, but without it or if there was an error in some section of this process, it would not be possible.

The general objective of inferential statistics is to draw conclusions about unknown parameters of a population, based on the information and/or results contained in the statistics of a representative sample of that population. This process is called statistical inference. For this reason, inferential statistics allows validating or refuting preliminary conjectures drawn from descriptive statistics.

The extraction of the results from a sample and inferring them on a population has advantages, especially in the economic aspect and in time, where savings are achieved. However, it also has drawbacks, such as data quality. To avoid these problems and to be able to infer the results and extract the population parameters, it is necessary to meet three basic requirements: the correct selection of the type of sampling that best suits the investigation, calculating the representative sample size of the population and the content of the investigation.

In addition, it is necessary to highlight the importance of probability theory as one of the fundamental theoretical pillars on which the development and application of inferential statistics is based. This allows us to establish predictions, such as the characteristics of a variable that it would adopt from a sample of subjects. The essential importance of probability lies in its ability to estimate or predict events.

## 5. Spatial statistics: the space and time of processes.

Spatial statistics aims to describe, explore, visualize and analyze data considering their distribution characteristics in space. For this, spatial information is key, which has the ability to be statistically analyzed through the application of usual statistical techniques, explained in the previous topics. The characteristics that differentiate spatial statistics from other branches of statistics such as descriptive or inferential statistics is the use of geographic locations in the specifications of the statistical model. However, spatial statistics has a number of differences from classical or conventional statistics. On the one hand, spatial analysis includes a set of tools that extend the capabilities of traditional statistical analysis. On the other hand, the observations are not considered independent, but it is implicitly assumed that they are correlated with each other, that is, that there is spatial dependence.

Within this topic, it is necessary to talk about spatial data, which refers to observations and measurements made in specific locations and/or areas. Both locations and information/data can be referred to and represented as points, lines or areas. Spatial statistical analysis includes very diverse procedures, which can be included in: centrographic measurements, statistical analysis of lines, analysis of point patterns, spatial autocorrelation and interpolation/extrapolation. Within these analyses, basic



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elements of both descriptive statistics and inferential statistics are necessary.

Within Geography, spatial statistics has applications in different branches and/or areas within it, such as: climatology, population geography, economic geography, tourism geography, among many others.

# WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	30,00	100
Computer classroom practice	15,00	100
Other activities	15,00	100
Preparation of evaluation activities	20,00	0
Preparing lectures	10,00	0
Preparation of practical classes and problem	60,00	0
ΤΟΤΑΙ	150,00	A

# TEACHING METHODOLOGY

Utilization of IT basic tools for the learning of the statistics. Work in class (theory) and at laboratory of computer science.

The students will have to realize out of the hours of class practical exercises of application of the acquired knowledge and follow the examples that will explain in class. The basic necessary information will be facilitated in class or throught the Virtual Classroom.

# **EVALUATION**

The grade obtained will be obtained from the following weighting of the various evaluable elements:

a) Exam: 60%\*

b) Dossier of practical exercises: 25% For the accounting of this item it will be a necessary condition - without exception - to have delivered the practices inexcusably and without any exception through the Virtual Classroom and within the established deadlines. As well as attendance at least 80% of the practical classes of the subject.

c) Complementary activities: 15% of the final grade.

\* Regarding the evaluation of the exam, it is necessary to obtain a minimum grade of 4 out of 10, to consider and add the grades obtained in the practice dossier and in the complementary activities, which must have a minimum rating of 4.



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In the case of students who, in the second call, have decided to opt for the exam to represent 100% of their final grade, it is a necessary condition that they obtain a minimum grade of 5 out of 10 in the exam.

# REFERENCES

### Basic

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