



**UCAM**  
UNIVERSIDAD  
CATÓLICA DE MURCIA

# Course Guide 2019/2020

## Fundamentals of Applied Mathematics and Statistics

Mode: On Campus

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## Fundamentals of Applied Mathematics

Module: **Physics and Mathematics**

Subject: **Statistics**

Level: **Basic**

No of credits: **6 ECTS.**

Course Professor: **Santiago López-Miranda González.**

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Office hours: **Tuesday de 10:00 a 12:00h y Thursday de 16:30 a 18:30h.**

Professor coordinating the Module: **Santiago López-Miranda González**

Academic Season: **1<sup>st</sup> Course – 1<sup>st</sup> Semester.**

## Brief Description

Fundamentals of Applied Mathematics and Statistics is a necessary subject for the subsequent compression of physical, chemical and scientists needed for proper training as Pharmaceuticals. Its main objective is to acquire basic knowledge in mathematics and statistics to achieve the specific objectives of this Grade.

## Prerequisites

None

## Objetives

1. Master the principles of basic mathematical calculation.
2. Know the usefulness and practical application of the various mathematical and statistical functions and tools.
3. Encourage mathematical reasoning and the ability to solve complex problems.
4. Develop the ability to interpret mathematical results both numerically and graphically.
5. Become familiar with the use of technologies at the service of mathematics.

## Competences and Learning Outcomes

### Basic competences

MECES1.- That students demonstrate to understand knowledge in an area of study that starts from the base of general secondary education, and is usually found at a level that, although supported by advanced textbooks, also includes some aspects that imply knowledge coming from the vanguard of its field of study.

MECES2.- That students know how to apply their knowledge to their work in a professional way and have the skills that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study.

MECES3.- That students have the ability to gather and interpret relevant data in order to make judgments that include a reflection on relevant social, scientific or ethical issues.

MECES4.- That students transmit information, ideas, problems and solutions to a specialized and non-specialized public

MECES5.- That students develop those learning skills necessary to undertake further studies with a high degree of autonomy.

### General Competences

CG3.- To know how to apply the scientific method and to acquire skills in the handling of legislation, sources of information, bibliography, elaboration of protocols and other aspects that are considered necessary for the design and critical evaluation of preclinical and clinical trials.

CG13.- To develop communication and information skills, both oral and written, to deal with patients and users related to their professional activity. To promote the capacities of work and collaboration in multidisciplinary teams and those related to other health professionals.

CG15.- To recognize limitations and the need to maintain and update professional competence, paying special attention to the self-learning of new knowledge based on scientific evidence.

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### Interdisciplinary competences

CT1.- Prepare and write scientific reports.

CT2.- Demonstrate critical and self-critical reasoning.

CT4.- Incorporate into their behavior the ethical principles that govern research and professional practice.

CT7.- Reading and listening comprehension, oral and written production that allows him to develop in a professional context in English. Interpretation of texts in technical and scientific English in the field of research. Communicate in Spanish and English using the usual audiovisual media.

CT8.- Defend personal points of view based on scientific knowledge.

CT9.- Integrate knowledge and apply it to solve problems using the scientific method.

CT10.- Acquire capacity for organization, planning and execution.

CT11.- Development of autonomous or team work capacity in response to the specific needs of each situation.

CT13.- Progress in his ability to work in multidisciplinary groups.

CT16.- Being able to show creativity, initiative and entrepreneurial spirit to face the challenges of his activity as a pharmacist.

### Specific Competences

CEM2.1.- Apply the knowledge of Physics and Mathematics to the pharmaceutical sciences.

CEM2.3.- Design experiments based on statistical criteria.

CEM2.4.- Evaluate scientific data related to medicines and health products.

CEM2.5.- Use statistical analysis applied to pharmaceutical sciences.

## Methodology

Methodology	Hours	Hours of classroom work	Hours of Non-Classroom Work
Classroom based Classes	24	60 (40 %)	
Seminars	18		
Academic Tutorials	12		
Classroom Evaluations	6		
Personal Study	63		90 (60%)
On-line Tutorials	9		
Resolution of Exercises and Practical	9		

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Cases			
Project Completion and Oral Presentations	9		
<b>TOTAL</b>	<b>150</b>	<b>60</b>	<b>90</b>

## Syllabus

### Theoretical program

#### Part I: Mathematics

Topic 1. Resolution of equations and non-algebraic equations

1. Algebraic equations
2. Non-Algebraic Equations

Topic 2. Differential calculus and derivatives application

1. Introduction to differential calculus
2. Derivation
3. Derivatives application

Topic 3. Integration and integrals application

1. Introduction
2. Rules of integration
3. Integrals application

#### Part II: Statistics

Topic 4. Statistics in Health Sciences

1. Introduction
2. Basic concepts of statistics
3. Samples, sampling, design of experiments and clinical trials

Topic 5. Descriptive statistics (Frequencies)

1. Introduction
2. Data Grouping
3. Frequency distribution.
4. Frequency graphic representation

Topic 6. Descriptive statistics

1. Introduction

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2. Central tendency measurements
3. Variability or dispersion measurements
4. Estimation

### Topic 7. Introduction to the calculation of probabilities

1. Introduction
2. Confidence intervals
3. Level of significance and power of an experiment. Hypothesis contrast
4. Analysis of variance. Comparison of means between groups

### Practical program

General use of spreadsheets (Excel)

Advanced calculations and graphic management with spreadsheets.

Computer tools for statistics.

Resolution of practical cases.

## Relationship to Other Courses of the Study Plan

Fundamentals of Applied Mathematics and Statistics is part of the basic subjects necessary to provide a solid base of knowledge in which to sustain the teaching and learning of the specific subjects that will subsequently be studied.

Fundamentals of Applied Mathematics and Statistics will provide the student with the tools and knowledge necessary to solve all the problems that require mathematical calculations, and statistical interpretation such as chemical physics, experimental studies, scientific analysis, etc.

## Grading System

### For de February/September Sessions

- Practical exams and seminars (50%). Practices and/or seminars will be evaluated through the realization and later correction of practical cases that collect the contents worked on in the practical classes and seminars. It is mandatory to approve the part of seminars to approve the subject. The cut-off note for this part is 5.

Theoretical exams (50%). Exams or tests) will be carried out with theoretical-practical questions and problem solving that gather the contents of the studied subject. It is mandatory to approve the theory part to pass the subject. The cut-off note for this part is 5.

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The student shall pass the subject when the weighted average is equal to or greater than 5 points and all the parts that make up the grading system have been passed, with an overall weight equal to or greater than 20%.

If the student has less than 5 in any of the parts with a weight equal to or greater than 20%, the subject will be suspended, and the student must retake the part(s) in the next session within the same academic year. The suspended part(s) in official sessions (February/June) will be saved for successive sessions that are held in the same academic year.

In the event that the subject is not passed in the September session, the passed parts will not count for successive academic years.

The grading system (RD 1.125/2003. of September 5) shall be the following:

- 0-4.9 Suspended
- 5.0-6.9 Passed
- 7.0-8.9 Excellent
- 9.0-10 Outstanding (SB)

Honorable mention may be granted to students who have earned a grade equal to or greater than 9.0. This number may not exceed 5% of the total number of students enrolled in a subject in the corresponding academic year, unless the number of students enrolled is less than 20, in which case only a single honorable mention may be granted.

## Bibliography and Reference Sources

### Basic Bibliography

- Martín, A. (2004). *Bioestadística para las Ciencias de la Salud*. Madrid: Norma.
- Milton, J.S. (1987). *Estadística para biología y ciencias de la salud*. Madrid: McGraw–Hill.
- Spiegel, M.R. (1976). *Probabilidad y estadística*. México: McGraw–Hill.
- Viedman, J.A. (1981). *Exposición intuitiva y problemas resueltos de métodos estadísticos*. Madrid: del Castillo.
- Rius-Díaz, F., Barón-López, F.J. (2005). *Bioestadística*. Madrid: Thomson Editores.
- Sentís, J. (2001). *Manual de bioestadística*. Barcelona: Masson.
- Solka, R. (1999). *Introducción a la Bioestadística*. Barcelona: Reverté.

### Additional Bibliography

- Bovas, A. (1983). *Statistical methods for forecasting*. New York: John Wiley & Son.
- Abascal, E. (2005). *Análisis de encuestas*. Madrid: ESIC.
- Saínez, M. (1999). *Estadística*. Bilbao: Universidad de Deusto.
- Azorín, F. (1994). *Métodos y aplicaciones del muestreo*. Madrid: Alianza Editorial.
- Box, G.E.P. (2001). *Estadística para investigadores: introducción al diseño de experimentos, análisis de datos y construcción de modelos*. México: Reverté.
- Canavos, G.C. (1988). *Probabilidad y estadística: aplicaciones y métodos*. México: McGraw-Hill.
- Carrasco de la Peña, J.L. (1995). *El método estadístico en la investigación médica*. Madrid: Ciencia 3.



## Related websites

[www.rsme.es](http://www.rsme.es). *Real Sociedad Matemática Española*

<http://www.ine.es/> *Instituto Nacional de Estadística*

<http://biostatistics.oxfordjournals.org/content/by/year> *Oxford journals*

<http://e-stadistica.bio.ucm.es/> *Aula virtual de bioestadística*

[http://www.hrc.es/bioest/M\\_docente.html](http://www.hrc.es/bioest/M_docente.html) *Unidad de Bioestadística Clínica (Hospital Universitario Ramón y Cajal)*

## Study recommendations

Daily continuous study of the subject.

## Teaching materials

For a correct development of the subject, the student must have:

- Scientific calculator
- Computer with Microsoft Excel program. If you do not have it, you can perform the tasks and jobs in the University's API classroom.

## Tutorials

The academic tutoring will have among its objectives to guide students on the contents of the subject, study methods and evaluation system. The doubts about the taught subject will be solved and basic concepts will be reinforced for an adequate follow-up of the syllabus, in those students that require it. In addition, it will be advisable to read different articles and monographs to expand the knowledge of the subject.

The University also has a Special Body of Tutors that conducts personal tutoring with the students enrolled in the degree. The personal tutor accompanies the students throughout the university stage. You can check the following link:

<https://www.ucam.edu/servicios/tutorias>