VNIVERSITAT DE VALÈNCIA

Course Guide
36407 Mathematical analysis

COURSE DATA

Data Subject	
Code	36407
Name	Mathematical analysis
Cycle	Grade
ECTS Credits	6.0
Academic year	2022 - 2023

Study (s)

Degree	Center	Acad. year	Period
1406 - Degree in Data Science	School of Engineering	1	First term

Subject-matter

Degree	Subject-matter	Character
1406 - Degree in Data Science	1 - Mathematics	Basic Training

Coordination

Name	Department
RUEDA SEGADO, MARIA PILAR	15 - Mathematical Analysis

SUMMARY

The subject Mathematical Analysis is framed within the basic scientific training that every student of engineering must acquire before fully entering into the specific questions of the degree. The basic objective is to provide a mathematical training that allows to correctly base the necessary knowledge in the Degree in Data Science.

In this subject, the classical contents of mathematical analysis are developed: Basic concepts of functions, sequences and series, differential and integral calculus and an introduction to the functions of several real variables.

Theory lessons will be taught in Spanish and practical and laboratory lessons as according to the information sheet available on the web of the degree.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

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

Other requirements

To successfully complete this subject, students should know the contents of Mathematics I and II taught in upper secondary education.

COMPETENCES (RD 1393/2007) // LEARNING OUTCOMES (RD 822/2021)

1406 - Degree in Data Science

- (CG01) Knowledge of basic subjects and technologies that enable students to learn new methods and technologies, and to provide them with versatility to adapt to new situations.
- (CG05) Analysis and synthesis capability in the preparation of reports and in the defence of ideas.
- (CT03) Ability to defend your own work with rigor and arguments and to expose it in an adequate and accurate way with the use of the necessary means.
- (CE01) Ability to solve the mathematical problems that can be posed in data science and be able to apply knowledge on: linear algebra, differential and integral calculus and numerical methods and optimisation.
- (CB2) Students must be able to apply their knowledge to their work or vocation in a professional manner and have acquired the competences required for the preparation and defence of arguments and for problem solving in their field of study.

LEARNING OUTCOMES (RD 1393/2007) // NO CONTENT (RD 822/2021)

This course allows students to acquire the following skills and abilities (CB2, CG01, CG03, CG07, CT03, CE01):

- Understand and work on the concepts of limit of sequences and functions, derivatives and integrals.

- Operate derivatives through their basic properties, the chain rule or the theorem of the inverse function.

- Obtain primitives of functions with different methods.

- Understand and know how to use the concept of function of several variables and its partial derivatives.

- Understand and know how to use the concepts of gradient and Hessian of a function.

DESCRIPTION OF CONTENTS

1. Functions of a real variable

Definition and basic concepts.
Elementary functions
Operations with functions.

2. Sequences and series

Sequences of real numbers.
Calculation of limits.
Series of real numbers.
Convergence criteria.

3. Differential calculus

Differential calculus.
Concept of derivative.
Geometric interpretation, tangent line.
Derivation of elementary functions.
Algebraic properties for calculating derivatives, rule of the chain.
Taylor series.

4. Integral calculus

Integral calculus.
Finding immediate primitives.
Integration by parts.
Integration with change of variables.
Integrals of rational functions.
Fundamental theorem of calculus.
Definite integrals.
Applications.

5. Functions of several variables.

Functions of several variables.
Basic concepts of the Euclidean space RxR, and functions of several variables.
Partial and directional derivatives.
Gradient and Hessian.
Tangent plane.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	28,00	100
Laboratory practices	20,00	100
Classroom practices	12,00	100
Development of individual work	20,00	0
Study and independent work	50,00	0
Preparation of evaluation activities	10,00	0
Preparation of practical classes and problem	10,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

Theory contents and adequate tools for problem solving will be gradually introduced and developed (CG01, CE01). A series of results, questions and problems will be proposed for students to be solved by applying the concepts presented in theory lessons (CG02, CG07, CE01). Students will present their solutions to the problems proposed (CT03).

A computer software pack for symbolic calculus will be used to supplement theory lessons, both visually and conceptually and regarding problem solving. This should also be useful as an experimentation method which may provide an improvement of intuitive knowledge (CG01, CG02).

The teaching methodology is based on the following strategies:

a) Lectures

b) Interactive activities: problem-based independent learning.

Theoretical activities

Lectures (single group)

Practical activities

Problem solving (single group)

Laboratories

Working in the classroom computer (four subgroups)

EVALUATION

The evaluation criteria for the subject is based on and follows the recommendations of the AC2PI model of the ETSE-UV.

The evaluation of the learning will be made taking into account the participation of students during the course and through a final exam. The final grade of the subject will be done with the following criteria:

(A) The final exam has a weight of 35% of the final grade. It will be necessary to obtain a minimum of 4 out of 10 in the final exam in order to pass the course (CB2, CG01, CG02, CT02, CT03, CE01).

(B) Continuous assessment:

(B1) The delivery of the laboratory practices (compulsory activity, 30% of the final grade, CB2, CG01, CT03, CE01).

(B2) The completion of partial exams (compulsory activity non recoverable, 35% of the final grade, CB1, CB2, CG01, CG02, CT03, CE01).

For the second call, the evaluation system will be the same as that followed in the first call. Students will be able to use the grade obtained in the first call in the laboratory sessions, but only in the case it is greater than or equal to 5 points, or make a final test for recovering the computer lab grade in conditions similar to those of the computer lab classes. This test will be done on the same day as the second exam. For organizational reasons, the faculty may require prior registration for this recovery test, which would be announced well in advance. In this second call, the student will keep the marks corresponding to the partial exams done during the course.

In any case, the evaluation system will be regulated by that stated in the Evaluation and Qualification Regulations of the University of Valencia for Degrees and Masters

https://webges.uv.es/uvTaeWeb/MuestraInformacionEdictoPublicoFrontAction.do?accion=inicio&idEdictoSeleccionado=5639

REFERENCES

Basic

- Larson, R.; Hostetler, R. P. y Edwards, B. H., Cálculo I, McGraw-Hill (2006) ISBN: 9789701057100
- Neuhauser, C., Matemáticas para Ciencias, Pearson (2004) ISBN: 9788420542539
- James, G., Matemáticas avanzadas para la ingeniería. Segunda Edición, Pearson Education (2002) ISBN: 970-26-0209-2

Additional

- Apostol, T. M., Calculus, Ed. Reverté (1985) ISBN 997151396
- Stewart, J., Cálculo multivariable, Ed. Thomson Learning (2003) ISBN 9706861238