

**COURSE DATA****DATA SUBJECT****Code:** 36418**Name:** Time series**Cycle:** Undergraduate Studies**ECTS Credits:** 6**Academic year:** 2025-26**STUDY (S)**

Degree	Center	Acad. year	Period
1400 - Degree in Computer Engineering	Escola Tècnica Superior d'Enginyeria	4	First quarter
1406 - Degree in Data Science	Escola Tècnica Superior d'Enginyeria	3	First quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1400 - Degree in Computer Engineering	Optional subject	ELECTIVES
1406 - Degree in Data Science	Statistical Modelling	COMPULSORY

COORDINATION

CORBERAN VALLET ANA

SUMMARY

The subject *Series Temporales* is a compulsory subject taught in the first semester of the third year of the Degree in Data Science. This course has two main objectives: to provide students with knowledge and understanding of the different types of data that make up a time series, as well as their main properties, and to provide practical knowledge of the main models and techniques to explain the evolution of a variable of interest over time and predict its future values.

Thus, after an introduction where the concept of times series is formalized and the descriptive analysis of a time series is discussed, some of the main univariate models for time series analysis are presented: exponential smoothing, ARIMA models, GARCH and NARX models.

The theoretical classes will be taught in Spanish and the practical classes as stated in the course guidelines available on the website for this 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

For an adequate follow-up of this subject, it is recommended to have knowledge about the foundations of probability and inference that are acquired in the subjects Probabilidad y simulación (1st year), Inferencia estadística (2nd year) and Modelos lineales (2nd year.)

COMPETENCES / LEARNING OUTCOMES

1400 - Degree in Computer Engineering

C3 - Ability to recognise and develop computational learning techniques and to design and implement applications and systems that use them, including those for the automatic retrieval of information and knowledge from large volumes of data.

Capacidad para participar activamente en la especificación, diseño, implementación y mantenimiento de los sistemas de información y comunicación.

1406 - Degree in Data Science

(CB4) Students must be able to communicate information, ideas, problems and solutions to both expert and lay audiences.

(CB5) Students must have developed the learning skills needed to undertake further study with a high degree of autonomy.

(CE09) To methodologically know and apply the concepts and techniques of probability and statistics necessary for the extraction of useful knowledge from data analysis.

(CE15) Ability to model and analyse the uncertainty in data-based studies, as well as to know how to interpret and contextualise the results obtained.

(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.

(CT01) To be able to access (bibliographical) information tools and appropriately use them in the development of their daily tasks.

(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.

DESCRIPTION OF CONTENTS



1. Introduction to time series

- 1.1. Concept of time series.
- 1.2. Descriptive analysis of a time series.
- 1.3. Components of a time series.
- 1.4. Stochastic processes.

2. Exponential smoothing models

- 2.1. Simple exponential smoothing.
- 2.2. Double exponential smoothing: Holts model.
- 2.3. Triple exponential smoothing: Holt-Winters model.
- 2.4. Diagnosis of the model.

3. ARIMA models

- 3.1. Autoregressive process (AR).
- 3.2. Moving average process (MA).
- 3.3. Autoregressive and moving average model (ARMA).
- 3.4. Autoregressive integrated moving average model (ARIMA).
- 3.5. Seasonal ARIMA process.
- 3.6. Estimation and selection of ARIMA models.
- 3.7. Diagnosis of the model.

4. Other models

- 4.1. ARCH model.
- 4.2. GARCH model.
- 4.3. NAR and NARX models.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	32,00
Laboratory	20,00
Classroom practices	8,00
Total hours	60,00

**NON PRESENCIAL ACTIVITIES**

Activity	Hours
Attendance at other activities	0,00
Individual or group project	15,00
Independent study and work	25,00
Preparation of lessons	30,00
Preparation for assessment activities	10,00
Resolution of case studies	10,00
Total hours	90,00

TEACHING METHODOLOGY

MD1 – Theoretical activities. Expository development of the subject with the participation of the students in the resolution of specific questions. In the theoretical sessions, the content of the subject will be developed, encouraging student participation in the class all the time. (Competency CG1)

MD2 – Practical activities. Learning through problem solving and the analysis of case studies, which enable acquisition of skills on different aspects of the subject. (Competencies CB4, CB5, CT1, CT3, CE9, CE15)

MD3 – Laboratory and/or computer classroom work. Learning through activities carried out in small groups in laboratories and/or computer classrooms. Each working group will analyze different time series with the methodology presented in the theoretical sessions using the statistical software R. They will have to present a report of results at the end of the semester. Emphasis will be placed on the advantages and limitations of the studied techniques. (Competencies CB4, CB5, CG5, CT1, CT3, CE9, CE15)

The virtual classroom of the Universitat of València (*Aula Virtual*) will be used to support communication with students. In particular, students will have access to all the educational material and it will serve as a repository for the tasks that have to be delivered.

EVALUATION

In the first call, the course will be evaluated according to three aspects:

- SE1: Objective test, which will be carried out at the end of the teaching period. It will consist of theoretical and practical questions and problems. This section of the evaluation will count 50% of the final grade of the course. The minimum grade that must be obtained in this section, to compensate with the other sections, is 5 out of 10. (Evaluation of competencies CB4, CB5, CG1, CE9, CE15).
- SE2: Evaluation of practical activities based on the final report of results. This section of the evaluation will count 35% of the final grade of the course. The minimum grade that must be obtained in this section, to compensate with the other sections, is 5 out of 10. (Evaluation of competencies CB4, CB5, CG1, CG5, CT1, CT3, CE9, CE15).
- SE3: Continuous evaluation of each student, based on the resolution of regularly proposed questions. This section of the evaluation will count 15% of the final grade of the course and it cannot be retaken. (Evaluation of competencies CB5, CG1, CE9, CE15).

In the second call, the objective test will be retaken (SE1). The practical activities (SE2) will be re-evaluated via an individual practical exam carried out in conditions equivalent to those of a practical assignment, but with time limitation. For the continuous evaluation (SE3), the grades obtained throughout the course will be



used, as this component cannot be retaken. The three blocks of the evaluation will be weighted with the same percentages as in the first call, and the minimum grades for blocks SE1 and SE2 will remain the same.

In any case, the evaluation system will be governed by the provisions of the Evaluation and Qualification Regulations of the University of Valencia for Bachelor's and Master's degrees (<https://webges.uv.es/uvTaeWeb/MuestralInformacionEdictoPublicoFrontAction.do?accion = inicio & idEdictoSeleccionado = 5639>).

Copying or plagiarism of any activity that is part of the evaluation will result in the impossibility of passing the course, and the student will then be subject to the appropriate disciplinary procedures indicated in the ACTION PROTOCOL FOR FRAUDULENT PRACTICES AT THE UNIVERSITY OF VALENCIA ([ACGUV 123/2020](#)).

REFERENCES

- D. Peña (2010) Análisis de series temporales (2a edición). Alianza Editorial.
- P.S.P. Cowpertwait and A.V. Metcalfe (2009) Introductory time series with R. Springer.
- C. Chatfield and H. Xing (2019) The analysis of time series: An introduction with R (7th edition). Chapman & Hall / CRC.
- R.J. Hyndman and G. Athanasopoulos (2018) Forecasting: principles and practice (2nd Edition). OTexts: Melbourne, Australia. <https://otexts.com/fpp2/>