



## IDENTIFYING DATA

### (\*)Análise cronobiolóxico de sinais biomédicas

Subject	(*)Análise cronobiolóxico de sinais biomédicas			
Code	V04M192V01306			
Study programme	Máster Universitario en Ingeniería Biomédica			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	4.5	Optional	2nd	1st
Teaching language	Spanish			
Department				
Coordinator	Hermida Domínguez, Ramón Carmelo Mojón Ojea, Artemio			
Lecturers	Hermida Domínguez, Ramón Carmelo Mojón Ojea, Artemio			
E-mail	rhermida@uvigo.es amojon@uvigo.es			
Web	<a href="http://moovi.uvigo.gal">http://moovi.uvigo.gal</a>			
General description	<p>This course intends:</p> <ul style="list-style-type: none"> <li>- Provide knowledge on other frequency/temporal scales that are common in clinical practice.</li> <li>- Provide knowledge on methods for analysis of noisy biomedical signals, with short duration, and/or with non-equidistant sampling, evaluating individuals as well as specific groups of patients or populations.</li> <li>- Contribute to the understanding of the clinical, diagnostic and prognostic importance of specific parameters extracted from biomedical signals.</li> <li>- Train in the use of computer tools to solve problems of the contents of the course.</li> </ul>			

## Training and Learning Results

Code	
A5	Students must possess the learning skills that enable them to continue studying in a way that will be largely self-directed or autonomous.
B3	Knowledge in basic and technological subjects that will enable students to learn new methods and theories, and provide them the versatility to adapt to new situations.

## Expected results from this subject

Expected results from this subject	Training and Learning Results
Know other spectral/temporal scales that appear in the clinical practice. Knowledge of analysis methods for noisy biomedical signals, short biomedical signals and/or with non-equidistant sampling.	B3
Being able to apply techniques to model biomedical signals of individuals and/or populations. Understand the clinical, diagnostic or prognostic importance of parameters extracted from biomedical signals.	A5 B3
Use computer tools to solve problems of the course contents.	A5

## Contents

Topic	
Topic 1	Presentation and work environment
Topic 2	Introduction to biological rhythms
Topic 3	Review of linear regression concepts
Topic 4	Rhythmometry of individual (longitudinal) time series: single cosinor, multiple components rhythmometry, model comparison

Topic 5	Rhythmometry of population (hybrid) time series: mean population cosinor, population multiple components rhythmometry, model comparison
Topic 6	Chronobiological serial section
Topic 7	Reference limits

## Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	14	14	28
Problem solving	5.5	11	16.5
Practices through ICT	12	18	30
Problem and/or exercise solving	2	4	6
Laboratory practice	1.5	9	10.5
Presentation	1	9	10
Essay questions exam	1.5	10	11.5

\*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

## Methodologies

	Description
Lecturing	The course is structured in seven blocks. Each one will have a theoretical part that will be presented by the teaching staff trying to illustrate the concepts with real practical example
Problem solving	Although most of the practical work requires the use of a computer, we have considered it appropriate to include in this block the design of the analytical approach and the analysis of results. Students will be required to work previously on these problems.
Practices through ICT	Each topic is complemented with one or more computer practices. The work environment will be R (multipurpose free software, although with a marked statistical orientation), and will be complemented with some developments of the teaching staff for a faster progress

## Personalized assistance

Methodologies	Description
Lecturing	Students will have the opportunity to attend personalized tutorials in the modality that each teacher will establish for this purpose at the beginning of the course. Tutorials may be carried out in person or by telematic means. On the page of the course in MooVi, within the section "Teachers and tutorials" ( <a href="https://moovi.uvigo.gal">https://moovi.uvigo.gal</a> ) the contact details of the teaching staff will be specified.
Problem solving	Students will have the opportunity to attend personalized tutorials in the modality that each teacher will establish for this purpose at the beginning of the course. Tutorials may be carried out in person or by telematic means. On the page of the course in MooVi, within the section "Teachers and tutorials" ( <a href="https://moovi.uvigo.gal">https://moovi.uvigo.gal</a> ) the contact details of the teaching staff will be specified.
Practices through ICT	Students will have the opportunity to attend personalized tutorials in the modality that each teacher will establish for this purpose at the beginning of the course. Tutorials may be carried out in person or by telematic means. On the page of the course in MooVi, within the section "Teachers and tutorials" ( <a href="https://moovi.uvigo.gal">https://moovi.uvigo.gal</a> ) the contact details of the teaching staff will be specified.

## Assessment

	Description	Qualification	Training and Learning Results
Problem and/or exercise solving	Questions about the problems solved in the practices in relation to the contents of the lectures	30	A5 B3
Laboratory practice	Resolution of exercises with computer.	30	A5 B3
Presentation	Presentation of a tutored written assignment and its discussion with the teaching staff and the rest of the students.	20	A5
Essay questions exam	This test will consist of questions and problems of short answer, with questions related to the master classes, laboratory and presentations of the supervised written assignment.	20	B3

## Other comments on the Evaluation

Two assessment systems will be offered to the students taking this course: continuous assessment (CA) and global assessment (GA). Students who wish to renounce the continuous evaluation (choice by default), must notify the teaching staff within a period not exceeding two months from the beginning of classes.

The grades of the continuous assessment tests are only valid for the ordinary evaluation of the current academic year. The

tests of continuous assessment are not recoverable, that is, if someone cannot perform them, teachers have no obligation to repeat them (except in duly documented cases). In the continuous evaluation the final grade cannot be "not presented".

Students who do not opt for continuous assessment must take a final, theoretical and practical, exam on all the contents of the course. This exam will be graded between 0 and 10 and this will be the final grade obtained.

The exam of the extraordinary opportunity, as well as the exam of the end-of-career opportunity, will have a structure similar to the final exam of students who do not opt for continuous evaluation.

The course is considered passed if the final obtained grade is equal to or greater than 5.

In case of detected plagiarism in any of the tests, the final grade will be FAIL (0) and the fact will be communicated to the direction of the Center for the appropriate effects.

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## Sources of information

### Basic Bibliography

Weisberg S, **Applied Linear Regression**, 9781118386088, 4, J Wiley & Sons, 2013

Yihui X, J J A, Garrett G, **R Markdown**, 9781138359338, 1, Chapman & Hall, 2018

Bingham C, Arbogast B, Guillaume GC, Lee JK, Halberg F, **Inferential statistical methods for estimating and comparing cosinor parameters**, Chronobiologia, 1982

Hermida RC, Fernández JR, Alonso I, Ayala DE, García L, **Computation of time-specified tolerance intervals for hybrid time series with nonequidistant sampling, illustrated for plasma growth hormone**, 10.3109/07420529709001461, Chronobiol Int, 1997

Fernández JR, Hermida RC, **Computation of model-dependent tolerance bands for ambulatorily monitored blood pressure**, 10.1081/cbi-100101064, Chronobiol Int, 2000

Fernández JR, Hermida RC, Mojón A, **Chronobiological analysis techniques. Application to blood pressure**, 10.1098/rsta.2008.0231, Philos Trans R Soc, A, 2009

### Complementary Bibliography

Fernández JR, Hermida RC, **Inferential statistical method for analysis of nonsinusoidal hybrid time series with unequidistant observations**, 10.3109/07420529808998683, Chronobiol Int, 1998

Fernandez JR, Mojón A, Hermida RC, Alonso I, **Methods for comparison of parameters from longitudinal rhythmometric models with multiple components**, 10.1081/cbi-120021383, Chronobiol Int, 2003

Fernández JR, Mojón A, Hermida RC, **Comparison of parameters from rhythmometric models with multiple components on hybrid data**, 10.1081/cbi-120038630, Chronobiol Int, 2004

Hermida RC, Smolensky MH, Ayala DE, Portaluppi F, Crespo JJ, Fabbian F, et al., **2013 Ambulatory Blood Pressure Monitoring Recommendations for the Diagnosis of Adult Hypertension, Assessment of Cardiovascular and other Hypertension-associated Risk, and Attainment of Therapeutic**, 10.3109/07420528.2013.750490, Chronobiol Int, 2013

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## Recommendations

### Subjects that it is recommended to have taken before

(\*)Estatística avanzada para a enxeñaría biomédica/V04M192V01101