

## SUBJECT TEACHING GUIDE

### G721 - Experimental Dynamics in Machines

### Degree in Industrial Technologies Engineering

Academic year 2025-2026

1. IDENTIFYING DATA					
Degree	Degree in Industrial Technologies Engineering			Type and Year	Optional. Year 4
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Subject Area: Mechanical Design Optional Module				
Course unit title and code	G721 - Experimental Dynamics in Machines				
Number of ECTS credits allocated	6	Term	Semester based (2)		
Web					
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. INGENIERIA ESTRUCTURAL Y MECANICA				
Name of lecturer	ALFONSO FERNANDEZ DEL RINCON				
E-mail	alfonso.fernandez@unican.es				
Office	E.T.S. de Ingenieros Industriales y de Telecomunicación. Planta: - 2. DESPACHO (S2042)				
Other lecturers	JESUS PASCUAL GARCIA CARLOS AGUILAR QUINTANA				

3.1 LEARNING OUTCOMES
- The student will be able to understand and evaluate the instrumentation used to measure mechanical quantities such as vibrations, noise, and strain.
- The student will understand and use the techniques and tools for analyzing and processing recorded data both in the time domain and in the frequency domain.
- The student will apply the measurement of the aforementioned quantities in condition-based maintenance and experimental modal analysis.
- The student will acquire advanced knowledge of durability testing.

#### 4. OBJECTIVES

The objectives of this course are to ensure that the student acquires undergraduate-level training in the following areas related to experimental dynamics problems in machinery:

Instrumentation for vibration measurement

Instrumentation for noise measurement

Instrumentation for strain measurement

Acquisition, analysis, and processing of dynamic signals

Vibration testing

#### 6. SUBJECT PROGRAM

##### CONTENTS

1	COURSE INTRODUCTION
2	INTRODUCTION TO EXPERIMENTAL TECHNIQUES IN MECHANICAL ENGINEERING
3	EXPERIMENTAL MEASUREMENT AND ANALYSIS OF VIBRATIONS - Vibration signals - Measurement chain - Seismic Mass Transducer - Accelerometers
4	ADQUISITION AND PROCESSING OF DYNAMIC SIGNALS - Dynamic Signals adquisition - Time domaine analysis - Frequency domaine analysis
5	MACHINERY CONDITION MONITORING - Preditive Maintenance - Vibration analysis techniques for machinery fault detection
6	NOISE MEASUREMENT AND CONTROL - Introduction to noise - Noise Measurement - Noise measurement and control in machinery
7	OTHER EXPERIMENTAL TECHNIQUES - Vibration tests - Strain gauges measurement - Fotoelasticity

7. ASSESSMENT METHODS AND CRITERIA				
Description	Type	Final Eval.	Reassessn	%
Exercices and activities carried out at classroom	Others	No	No	30,00
Laboratory practices	Laboratory evaluation	No	Yes	30,00
Final exam	Written exam	No	Yes	40,00
TOTAL				100,00
Observations				
Disruption of Teaching Activity Due to the Health Situation: In the event of a partial or total suspension of in-person teaching activities, this evaluation structure will be appropriately adapted according to the circumstances.				
Remote Assessment: If, due to the health situation, it is not possible to carry out any assessment activity in person, a remote evaluation method will be adopted using online tools.				
Observations for part-time students				
Part-time students who are unable to follow continuous assessment and have communicated this at the beginning of the course may be evaluated on that part through an exam.				

8. BIBLIOGRAPHY AND TEACHING MATERIALS
BASIC
An Introduction to Random Vibrations, Spectral & Wavelet Analysis. 3rd Ed. D. E. Newland Longman (1993), Dover Publications Inc, New York (2006)
Instrumentación aplicada a la ingeniería Jesus Fraile Mora, Pedro García Gutierrez, Jesús Fraile Ardanuy ISBN 978-84-1545-233-1 (2010)
Mechanical Vibration and Shoks Measurements Brüel and Kjaer (1980)
Noise and Vibration Analysis A. Brandt John Wiley & Sons (2011)
Vibration Testing Kenneth G. McConnell (1995)
Machinery Vibration V. Wowk McGraw-Hill (1991)
Engineering applications of correlation and spectral analysis J. Bendat, A. Piersol J. Wiley & Sons. (1980)