SUBJECT TEACHING GUIDE

M1446 - Railway Systems

Master's Degree in Civil Engineering

Academic year 2016-2017

1. IDENTIFYING DATA					
Degree	Master's Degree in Civil Engineering			Type and Year	Compulsory. Year 1
Faculty	School of civil Engineering				
Discipline	Transport Infrastructures				
Course unit title and code	M1446 - Railway Systems				
Number of ECTS credits allocated	3	Term	Semester based (1)		
Web					
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. TRANSPORTES Y TECNOLOGIA DE PROYECTOS Y PROCESOS
Name of lecturer	BORJA ALONSO OREÑA
E-mail	borja.alonso@unican.es
Office	E.T.S. Ingenieros de Caminos, C.P.. Planta: + 1. DESPACHO PROFESOR (1018)
Other lecturers	ANGEL IBEAS PORTILLA LUIGI DELL´OLIO

3.1 LEARNING OUTCOMES
- Knowing fundamentals on rail signalling systems and rail traffic management and control
- To know the main ATP systems on spanish and european railways and interoperability issues as well
- To identify rail signalling systems and their influence on capacity
- To know the on-board equipment and track equipment of rail signalling systems
- Sizing mass rail transit services:signalling and control, capacity, exploitation and demand

4. OBJECTIVES
Advanced concepts on urban, metropolitan, commuter and Long-distance rail systems

6. COURSE ORGANIZATION

	CONTENTS
1	Fundamentals on rail signalling
2	Track circuits and interlocking
3	Automatic Train Protection
4	ETCS (ERTMS)
5	Rail Traffic Control Center
6	Level crossing
7	Metropolitan railways (Heavy Rail Transit) part I
8	Metropolitan railways (Heavy Rail Transit) part II
9	Performance
10	Construction and exploitation costs
11	Final deliverable

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Final deliverable	Work	No	No	30,00
Final Exam	Written exam	Yes	Yes	60,00
Classroom exercises	Others	No	No	10,00
TOTAL				100,00

Observations

Evaluation criteria according to University of Cantabria procedures regulated on RD 1125/2003 and on 'evaluation activities' approved by the Civil Engineering School Assembly on june, 10th, 2010

Observations for part-time students

Final deliverable is mandatory to pass the course

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

González, F. J. (2009) "Señalización Ferroviaria: del guardagujas a la operación sin conductor"

Montes Ponce de León, F. (2011) "Los sistemas de control de tráfico y señalización en el ferrocarril". Publicaciones de la Universidad Pontificia Comillas.

Alonso, B., dell'Olio, L. Ibeas, A. (2016) "Sistemas ferroviarios. Apuntes de la asignatura"