UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course: NONLINEAR ANALYSIS AND DIFFERENTIAL EQUATIONS
Code: 310938
Type: ELECTIVE
ECTS credits: 6
Degree: 2351 - MASTER DEGREE PROGRAMME IN PHYSICS AND MATHEMATICS-FISYMAT
Academic year: 2019-20
Center: 602 - E.T.S. INDUSTRIAL ENGINEERING OF C. REAL
Group(s): 20
Year: 1
Duration: C2
Main language: Spanish
Second language: English
Use of additional languages:
English Friendly: Y
Web site:
Bilingual: N

Lecturer: **ALBERTO DONOSO BELLON** - Group(s): **20**

Building/Office	Department	Phone number	Email	Office hours
Edificio Politécnico/2-B17	MATEMÁTICAS	926295251	alberto.donoso@uclm.es	Se informará a comienzo del curso

2. Pre-Requisites

Previous knowledge of multivariable calculus, linear algebra, and ordinary and partial differential equations is required

3. Justification in the curriculum, relation to other subjects and to the profession

This course pretends to be a first contact to the field of optimization through mathamatical programming, calculus of variations and optimal control. It will be of great help not only for students with mathematical background but also for physicians and engineers interested in modeling some problems as optimization ones.

4. Degree competences achieved in this course

Course competences

Code	Description
CB06	Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.
CB07	Apply the achieved knowledge and ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to the area of study
CB08	Be able to integrate knowledge and face the complexity of making judgments based on information that, being incomplete or limited, includes reflections on social and ethical responsibilities linked to the application of knowledge and judgments
CB09	Know how to communicate the conclusions and their supported knowledge and ultimate reasons to specialized and non-specialized audiences in a clear and unambiguous way
CB10	Have the learning skills which allow to continue studying in a self-directed or autonomous way
CE03	Have the ability to build and develop advanced mathematical reasoning, and delve into the different fields of mathematics
CG05	Gain the ability to develop a scientific research work independently and in its entirety. Be able to search and assimilate scientific literature, formulate hypotheses, raise and develop problems and draw conclusions from the obtained results
CT03	Develop critical reasoning and the ability to criticize and self-criticize

5. Objectives or Learning Outcomes

Course learning outcomes

Description

Be able to apply the acquired knowledge to treat different non-linear differential equations

To conceive the need for weak derivation in the environment of Sobolev spaces

Become familiar with the different techniques of Nonlinear Analysis

6. Units / Contents

Unit 1: Linear programming

Unit 2: Non-linear programming

Unit 3: Calculus of Variations

Unit 4: Optimal control

Unit 5: Variational methods for non-linear analysis

7. Activities, Units/Modules and Methodology

Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	R	Description
Class Attendance (theory) [ON-								

SITE]	Lectures		3	75	N	-	-	
Writing of reports or projects [OFF-SITE]	Assessment tests		3	75	Y	Y	Y	
		Total:	**6**	**150**				
		Total credits of in-class work: 3			**Total class time hours: 75**			
		Total credits of out of class work: 3			**Total hours of out of class work: 75**			

As: Assessable training activity
Com: Training activity of compulsory overcoming
R: Rescheduling training activity

8. Evaluation criteria and Grading System

	Grading System		
Evaluation System	**Face-to-Face**	**Self-Study Student**	**Description**
Assessment of problem solving and/or case studies	15.00%	15.00%	Exercises to support the main concepts
Theoretical papers assessment	70.00%	70.00%	Oral presentation of a case study
Progress Tests	15.00%	15.00%	Regular tests
Total:	**100.00%**	**100.00%**	

9. Assignments, course calendar and important dates

Not related to the syllabus/contents

Hours	**hours**
Writing of reports or projects [AUTÓNOMA][Assessment tests]	75

Unit 1 (de 5): Linear programming

Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	15

Unit 2 (de 5): Non-linear programming

Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	15

Unit 3 (de 5): Calculus of Variations

Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	15

Unit 4 (de 5): Optimal control

Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	15

Unit 5 (de 5): Variational methods for non-linear analysis

Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	15

Global activity

Activities	**hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	75
Writing of reports or projects [AUTÓNOMA][Assessment tests]	75
Total horas:	150

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Pablo Pedregal	Introduction to Optimization	Springer		0-387-40398-1	2004	