UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course: MATHEMATICAL MODELS IN ECOLOGY
Code: 310223
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: First semester
Main language: Spanish
Second language: English
Use of additional languages:
English Friendly: Y
Web site:
Bilingual: N

Lecturer: **JUAN GABRIEL BELMONTE BEITIA** - Group(s): **20**

Building/Office	Department	Phone number	Email	Office hours
2-A28	MATEMÁTICAS	926295300	juan.belmonte@uclm.es	Se informará a comienzo del curso

Lecturer: **ALICIA MARTINEZ GONZALEZ** - Group(s): **20**

Building/Office	Department	Phone number	Email	Office hours
3.27	MATEMÁTICAS	6665	alicia.martinez@uclm.es	Al comienzo de curso se hará público en Moodle.

Lecturer: **VICTOR MANUEL PEREZ GARCIA** - Group(s): **20**

Building/Office	Department	Phone number	Email	Office hours
Politécnico/1.09.5	MATEMÁTICAS	926295435	victor.perezgarcia@uclm.es	To be determined

2. Pre-Requisites

Basic knowledge of Linear Algebra, Mathematical Analysis, Ordinary Differential Equations and Dynamic Systems

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

The analysis of the interaction between species that cohabit in the same environment, and the related issue of the propagation of behaviors or infections, is not only a topic of great interest in Biology, but has largely motivated the development of the theory of differential equations in the 20th century. In this course, we will review the basic mathematical models in this field, and we will pay special attention to the study of some representative examples.

4. Degree competences achieved in this course

Course competences

Code	Description
CE07	Ability to understand and apply advanced knowledge of mathematics and numerical or computational methods to problems of biology, physics and astrophysics, as well as to build and develop mathematical models in science, biology and engineering
CE08	Ability to model, interpret and predict from experimental observations and numerical data
CG01	Know how to work in a multidisciplinary team and manage work time
CG02	Ability to generate and independently develop innovative and competitive proposals in research and professional activity in the scientific field of Physics and Mathematics
CG03	Present publicly the research results or technical reports, to communicate the conclusions to a specialized court, interested persons or organizations, and discuss with their members any aspect related to them
CG04	Know how to communicate with the academic and scientific community as a whole, with the company and with society in general about Physics and/or Mathematics and its academic, productive or social implications
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
CG06	Gain the capacity for dialogue and cooperation with scientific and business communities from other fields of research, including social and natural sciences

5. Objectives or Learning Outcomes

Course learning outcomes

Description

Gain the skill to apply and study classical mathematical methods. Critical analysis of mathematical results and their interpretation in terms of the starting model, with a view to its possible improvement

Know and compare the basic models in Population Dynamics, both continuous and discrete

6. Units / Contents

Unit 1: Introduction to the mathematical problems on ecology

Unit 2: Continuous Models. Interaction of species. Predator / prey models.

Unit 3: Infections Propagation studies.

Unit 4: Discrete models. Periodicity and chaos. Matrix models and biological cycles.

Unit 5: Other models and applications

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 (practical) [ON-SITE]	Lectures	CE07	1.6	40	Y	N	Y	
Class Attendance (practical) [ON-SITE]	Project/Problem Based Learning (PBL)	CE08	1.4	35	Y	N	Y	
Practicum and practical activities report writing or preparation [OFF-SITE]	Individual presentation of projects and reports	CG01	0.66	16.5	Y	N	Y	
Problem solving and/or case studies [ON-SITE]	Case Studies	CG02	0.5	12.5	Y	N	Y	
Writing of reports or projects [OFF-SITE]	Reading and Analysis of Reviews and Articles	CG03	0.8	20	Y	N	Y	
Progress test [ON-SITE]	Assessment tests	CG04	0.12	3	Y	N	Y	
Study and Exam Preparation [OFF-SITE]		CG06	0.92	23	Y	N	Y	
		Total:	**6**	**150**				
		Total credits of in-class work: 3.62						**Total class time hours: 90.5**
		Total credits of out of class work: 2.38						**Total hours of out of class work: 59.5**

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 active participation	10.00%	0.00%	
Final test	60.00%	0.00%	
Assessment of problem solving and/or case studies	30.00%	0.00%	
Total:	**100.00%**	**0.00%**	

9. Assignments, course calendar and important dates

Not related to the syllabus/contents

Hours **hours**

Unit 1 (de 5): Introduction to the mathematical problems on ecology

Group 20:

Initial date: 23-09-2019 **End date:** 23-09-2019

Unit 3 (de 5): Infections Propagation studies.

Group 20:

Initial date: 04/11/2019 **End date:** 16/12/2019

Unit 4 (de 5): Discrete models. Periodicity and chaos. Matrix models and biological cycles.

Group 20:

Initial date: 13/01/2020 **End date:** 20/01/2020

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
J. Murray	Mathematical Biology Vol 1					
J. Murray	Mathematical Biology Vol 2					
J Muller, C. Kuttler	Methods and Models in Mathematical Biology					
F. Brauer, C. Castillo-Chavez	Mathematical Models in Population Biology and Epidemiology					
J. Hale, H. Koyac	Dynamics and Bifurcations					
S. Wiggins	Introduction to Applied Nonlinear Dynamics Systems and Chaos					