



IDENTIFYING DATA

Computational Methods

Subject	Computational Methods			
Code	O01M117V01205			
Study programme	(*)Máster Universitario en Fotónica e Tecnoloxías do Láser			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	1st	2nd
Teaching language				
Department				
Coordinator	Michinel Álvarez, Humberto Javier			
Lecturers	Michinel Álvarez, Humberto Javier			
E-mail	hmichinel@uvigo.es			
Web	http://laserphotonics.org			
General description	(*)A asignatura de métodos computacionais pretende dar unha panorámica das principais técnicas de cálculo numérico empregadas na resolución de problemas relacionados coa propagación de feixes láser e a súa interacción coa materia.			

Competencies

Code	
A1	Acquire knowledge and understanding that provide a basis or opportunity for originality in developing and / or applying ideas , often in a research context .
A2	That the students can apply their knowledge and their ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study.
A5	That the students have the learning skills that enable them to continue studying in a way that will be largely self-directed or autonomous.
B2	Ability to handle software tools that support the resolution of problems related to photonics and laser technologies.
C2	Ability to analyze, design and application of computational methods, nonlinear systems, numerical methods, numerical modeling, simulations, algorithms, and specific software for use in photonics and laser technologies.

Learning outcomes

Expected results from this subject	Training and Learning Results
Know the main methods of numerical calculation in the field of the technologies laser	B2
Implement codes for the numerical resolution of concrete problems of propagation laser and his interaction with the matter	A1 A2 A5 C2

Contents

Topic	
INTRODUCTION TO NUMERICAL COMPUTATION	NUMERICAL DERIVATION NUMERICAL INTEGRATION
SIGNAL PROCESSING AND SPECTRAL ANALYSIS	NUMERICAL REPRESENTATION OF WAVES PULSES AND GAUSSIAN BEAMS FAST FOURIER TRANSFORM
PROPAGATION ALGORITHMS OF LASER BEAMS AND PULSES	TIME-DEPENDENT SCHRÖDINGER EQUATION PROPAGATION OF LASER BEAMS AND PULSES WITH FFT PROPAGATION OF LASER BEAMS AND PULSES WITH FINITE DIFFERENCES

CALCULATION OF MODES IN LIGHT WAVEGUIDES	STATIONARY SCHRÖDINGER EQUATION CALCULATION OF MODES IN LINEAR 1D GUIDES CALCULATION OF MODES IN LINEAR 2D GUIDES CALCULATION OF MODES IN NONLINEAR 1D GUIDES CALCULATION OF MODES IN NONLINEAR 2D GUIDES
HEAT EQUATION	SPECTRAL METHODS METHODS OF FINITE DIFFERENCES

Planning

	Class hours	Hours outside the classroom	Total hours
Troubleshooting and / or exercises	10	0	10
Autonomous troubleshooting and / or exercises	0	100	100
Practice in computer rooms	38	0	38
Multiple choice tests	2	0	2

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

Methodologies

	Description
Troubleshooting and / or exercises	(*O profesor resolverá na clase os exercicios e problemas que servirán de modelo para os que o alumno deberá resolver de xeito autónomo.
Autonomous troubleshooting and / or exercises	(*O alumno resolverá de xeito autónomo os problemas e exercicios propostos polo profesor da asignatura
Practice in computer rooms	(*Os alumnos realizarán simulacións na aula de informática sobre os conceptos fundamentais da asignatura

Personalized attention

Methodologies	Description
Autonomous troubleshooting and / or exercises	

Assessment

	Description	Qualification	Training and Learning Results
Autonomous troubleshooting and / or exercises	(*Entrega periódica de boletines de problemas realizados de xeito autónomo	50	
Multiple choice tests	(*Examen tipo test con preguntas multiopción.	50	

Other comments on the Evaluation

Sources of information

Recommendations