UNIVERSIDADE DA CORUÑA

Teaching Guide				
Identifying Data				2015/16
Subject (*)	Ampliación de matemáticas		Code	730496015
Study programme	Mestrado Universitario en Enxeñaría Naval e Oceánica (plan 2012)			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	1st four-month period	First	Optativa	4.5
Language	SpanishGalicianEnglish			
Teaching method	Face-to-face			
Prerequisites				
Department	Matemáticas			
Coordinador	Brozos Vázquez, Miguel	E-mail	miguel.brozos.vazquez@udc.es	
Lecturers	Brozos Vázquez, Miguel García Rodríguez, José Antonio	E-mail	miguel.brozos.vazquez@udc.es jose.garcia.rodriguez@udc.es	
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General description	Nesta asignatura ampliaranse os conceptos matemáticos estudados nos graos de enxeñería. Así, traballarase con curvas e superficies, comprendendo a súa xeometría e os elementos que a describen xunto coas ferramentas que usamos habitualmente para estudialas. Introduciranse conceptos básicos de cálculo tensorial e a súa aplicación na formulación e estudo de ecuacións en derivadas parciais que aparecen na física e na enxeñería			

Study programme competences	
Code	Study programme competences
B1	Posuír e comprender coñecementos que acheguen unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, a miúdo nun contexto de investigación
B2	Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en ámbitos novos ou pouco coñecidos dentro de contextos máis amplos (ou multidisciplinares) relacionados coa súa área de estudo
B3	Que os estudantes sexan capaces de integrar coñecementos e enfrontarse á complexidade de formular xuízos a partir dunha información que, sendo incompleta ou limitada, inclúa reflexións sobre as responsabilidades sociais e éticas vinculadas á aplicación dos seus coñecementos e xuízos
B4	Que os estudantes saiban comunicar as súas conclusións e os coñecementos e razóns últimas que as sustentan a públicos especializados e non especializados dun modo claro e sen ambigüidades.
B5	Que os estudantes posúan as habilidades de aprendizaxe que lles permitan continuar estudando dun modo que haberá de ser en boa medida autodirixido ou autónomo.
B6	Ser capaz de realizar unha análise crítica, avaliación e síntese de ideas novas e complexas.

Learning outcomes	
Learning outcomes	Study programme competences
Knowledge of elementary tensor calculus	BC1 BC2 BC3 BC4
Ability to work with curves and surfaces and study their geometric properties: curvature, geodesics, ...	BC1 BC2 BC3 BC4 BC5 BC6

Aplication of tensor calculus to the formulation of partial differential equations from Physics.		BC1 BC2 BC3 BC4	
Capability to face typical problems in the context of naval engineering using basic differential geometry of curves and surfaces.		BC1 BC2 BC5 BC6	

Contents	
Topic	**Sub-topic**
Curves	Parametrized curves. Regular curves. Arc length. Curvature. Torsion. Frenet trihedron. Famous curves.
Surfaces	Parametrized surfaces. Regular surfaces. Tangent plane. First fundamental form. Surface area. Tensor fields. The metric tensor. Second fundamental form. Christoffel symbols. Gauss curvature and mean curvature. Ruled surfaces and minimal surfaces. Appendix 1: Einstein notation. Appendix 2: bilinear forms and quadratic forms.
Mathematics of continuum mechanics. Conservations laws	- Continuum cinematics - Gradient of strain tensor. Green-Saint Venant Strain tensor - Transformation of areas and volumes - Reynolds theorem of transport. - Mass conservation law. - Law of conservation of momentum - Thermodinamics. Law of conservation of energy - Control volumens and conservation laws
Partial differential equations	- Partial differential equations. Boundary conditions. - Constituive laws - Fluid mechanics. Derivation of some important equations in fluid mechanics. Equations for incompressible fluids. - Elastic solids. Cauchy Theorem. Stress and strain tensors. Principal components. Eigenvalues and eigenvectors. Partial differential equationspara for elastic solids.

Planning				
Methodologies / tests	**Competencies**	**Ordinary class hours**	**Student?s personal work hours**	**Total hours**
Seminar	B2 B3 B4 B5 B6	15	15	30
Supervised projects	B1 B2 B3 B4 B5 B6	0	3	3
Objective test	B1 B2 B3 B4 B5 B6	3.5	0	3.5
Guest lecture / keynote speech	B1 B2 B3 B6	30	45	75

Personalized attention		1	0	1
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	**Description**
Seminar	Technique of group work which purpose is the in-depth study of a subject. It involves discussion, participaction, edocuments elaboration and the conclussion reached by all the components of the seminar.
Supervised projects	Methodology designed to promote authonomous learning of the students, always under the teacher's guide. It is a technique based on the assumption by the students of the responsability of their learning. This learning technique is based in two basic elements: the authonomous learning and the continous monitoring of this learning by the teachers.
Objective test	Written test to asses the obtained competencies. It is an instruments of meassure, rigorously developed, that allows to evaluate knowledges, capacities, skills, performances, aptitudes, attitudes, etc.
Guest lecture / keynote speech	Oral presentation complemented with the use of audiovisual media and the introduction of some questions to the students, in order to transmit knowledge and provide learning

Personalized attention	
Methodologies	**Description**
Supervised projects	Along the course several works will be proposed to the students, and that will allow them, in case of obtaining a possitive evaluation, to pass the subject.

Assessment			
Methodologies	**Competencies**	**Description**	**Qualification**
Supervised projects	B1 B2 B3 B4 B5 B6	Students who wish to, can choose a topic from among those proposed by the teachers of the subject. They will do a work on this subject to deepen their concepts and techniques, and that they will have to expose later. This work will be qualified and will allow to pass the subject.	50
Objective test	B1 B2 B3 B4 B5 B6	At the end of the course, these students that have not done the proposed works or that want to obtain a better qualification, will do a written exam in the data fixed by the school.	50

Assessment comments
The works will be corrected and attending to this corrections students will be qualified. If a student does not present the proposed work or if he/she wants to obtain a better qualifications, he/she will be able to give up the obtained qualification and do the final exam.

Sources of information	
Basic	- Manfredo P. do Carmo (1995). Geometría diferencial de curvas y superficies. Alianza Universidad Textos - Rutherford Aris (1962). Vectors, tensors, and the basic equations of fluid mechanics.. Prentice-Hall - José A. Pastor González, Mª Ángeles Fernández Cifre (2010). Un curso de geometría diferencial. Consejo Superior de Investigaciones Científicas - Alexandre J. Chorin,Jerrold E. Marsden. (2000). A Mathematical Introduction to Fluid Mechanics. Texts in Applied Mathematic, Springer - M. Gurtin (1981). An introduction to continuum mechanics. Academic Press - M. Gurtin, Eliot Fried, Lallit Anand (2010). The mechanics and thermodynamics of continua. Cambridge
Complementary	

Recommendations
Subjects that it is recommended to have taken before

Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Other comments

(*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.