Course guide
280605 - 280605 - Fundamentals of Mathematics II

Last modified: 25/10/2023

Unit in charge: Barcelona School of Nautical Studies
Teaching unit: 749 - MAT - Department of Mathematics.

Degree: BACHELOR'S DEGREE IN NAUTICAL SCIENCE AND MARITIME TRANSPORT (Syllabus 2010). (Compulsory subject).

Academic year: 2023 **ECTS Credits:** 6.0 **Languages:** Catalan

LECTURER

Coordinating lecturer: MARIA MONTSERRAT VELA DEL OLMO - MARIONA GONZÁLEZ ESTEVE

Others: Primer quadrimestre:
MARIONA GONZÁLEZ ESTEVE - GNTM

Segon quadrimestre:
MARIA MONTSERRAT VELA DEL OLMO - GNTM

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. Ability to solve math problems that may arise in engineering. Ability to apply knowledge about: linear algebra, geometry, differential geometry to, differential and integral calculus, differential equations and partial differential, numerical methods, algorithmic numerical and statistical optimization.

TEACHING METHODOLOGY

(ENG) Receive, understand and summarize knowledge.
-Posing and solving problems.
-Developing arguments from a critical point of view and defending them.
-Doing work in group and individually.

LEARNING OBJECTIVES OF THE SUBJECT

- To be able to apply the knowledge on basic functions, differential and inetgral calculus, numerical methods and statistics.
- To solve the mathematical problems that arise in engeering.
- To develop the capacity of abstraction while solving problems.

STUDY LOAD

Type	Hours	Percentage
Self study	90,0	60.00
Hours large group	30,0	20.00
Hours medium group	30,0	20.00

Total learning time: 150 h

CONTENTS

/ENG) Functions.

Description:
(ENG) Real functions of one or several real variables. Graphics (curves and surfaces) and surfaces. Limits and continuity. Elementary functions: polinomials, rationals, exponentials, logaríthm, trigonometric and hiperbolic functions. Inverse functions. Numerical resolution of equations: Errors and their propagation. Bisection method.

Specific objectives:
(ENG)

Related activities:
(ENG)

Full-or-part-time: 20h
Theory classes: 8h
Self study : 12h

(ENG) Derivation.

Description:
(ENG) Derivatives of one real variable functions. Tangent vector. Computation of derivatives: chain rules, logarithmic derivation, implicit functions.
Derivatives of several real variables functions: partial derivatives, tangent plane, directional derivatives, gradient of a function.
Differentiable funcionts: Differential, Rolle and Lagrange's Theorems. Linear approximation of a function.
Power series: convergence, radius of convergence, sum of a power series. Taylor series for one ans two variables. Aplicació: approximations and limits computations.
Computations of extrema (minimum and maximum).
Numeric resolution of equations: Newton-Raphson method.

Specific objectives:
(ENG)

Related activities:
(ENG)

Full-or-part-time: 35h
Theory classes: 14h
Self study : 21h

(ENG) Integration.

Description:
(ENG) Primitive of a function. Methods of integration. Definite integral. Integral function and the rule of Barrow. Applications: areas and volumes of revolution.
Double and triple integrals: definition, iterated integrals and computation. Application: areas and volums, computation of CM and inertial moments.
Numerical integration: trapezoidal and Simpson's rules.

Specific objectives:
(ENG)

Related activities:
(ENG)

Full-or-part-time: 25h
Theory classes: 10h
Self study : 15h

(ENG) Ordinary Differential equations.

Description:
(ENG) Differential equations: definition and solutions. Ordinary differential equations of first and second order. Ordinary differential equations of second order with constant coefficients.

Specific objectives:
(ENG)

Related activities:
(ENG)

Full-or-part-time: 15h
Theory classes: 6h
Self study : 9h

(ENG) Statistics.

Description:
(ENG) Sampling and statistical analysis. Mean and variance. Parameter estimation. Sampling distribution. Confidence interval. Testing hypothesis. "Xi²" test.

Specific objectives:
(ENG)

Related activities:
(ENG)

Full-or-part-time: 20h
Theory classes: 8h
Self study : 12h

GRADING SYSTEM

The final grade is the sum of the following partial grades: Nfinal=0,90 NE+0,10 NC.
The NE= Max(Nmig, Nf) where
Nmig = 0,60 Nf + 0,40 Np
where Nfinal: final grade.
Nf: grade of the final test.
Np: grade of the parcial tests.

The final test consist of some theoretical questions about concepts realated to the course' learning aims, and a set of problems that require the application of the methods studied. Its duration is 3 hours.
The continuous grade consist of one or two test (each one hour long), the participation in class and the supervised activities carried out during the semester.

EXAMINATION RULES.

- If some of the activities of the continuous grade are missed, the continnuous grade is 0.
- A student which does not make the final test is being considered as 'No Presentat'.

BIBLIOGRAPHY

Basic:

- Larson, Ron E.; Hostetler, Robert P.; Edwards, Bruce H. Cálculo I. 8a ed. Madrid: McGraw-Hill, 2006. ISBN 9701052749.
- Braun, M. Ecuaciones diferenciales y sus aplicaciones. Mexico: Grupo editorial interamericano, 1990. ISBN 9687270586.
- Chapra, Steven C. Métodos numéricos para ingenieros [on line]. 6a ed. México: McGraw-hill, 2011 [Consultation: 01/09/2022]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=8099. ISBN 9786071504999.
- Colomer, M.A. Curs d'estadística. Lleida: ICE, Universitat de Lleida, 1997. ISBN 8489727503.
- Larson, Ron; Edwards, Bruce H. Cálculo [on line]. Novena edición. México, D.F.: McGraw-Hill Education, [2010] [Consultation: 30/05/2022]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_Escritorio_Visualizar?cod_primaria=1000193&libro=5686. ISBN 9781456239565.

Complementary:

- Ross, Sheldon M. Introducción a la estadística [on line]. Barcelona: Reverté, 2007 [Consultation: 01/09/2022]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=7717. ISBN 9788429150391.
- Salas, S.; Hille, E.; Etgen, G. Calculus, vol. 1. 4a ed. Barcelona: Reverte, 2002. ISBN 8429151575.
- Simmons, George Finlay. Ecuaciones diferenciales con aplicaciones y notas históricas. Madrid: McGraw-Hill Interamericana, 1993. ISBN 844810045X.
- Grau Sanchez, M.; Noguera Batlle, M. Càlcul numèric [on line]. Barcelona: Edicions UPC, 2000 [Consultation: 24/04/2012]. Available on: http://hdl.handle.net/2099.3/36356. ISBN 8483013819.