

340026 - CAAV-F2043 - Advanced Calculus

Coordinating unit:	340 - EPSEVG - Vilanova i la Geltrú School of Engineering
Teaching unit:	749 - MAT - Department of Mathematics
Academic year:	2019
Degree:	BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory) BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory) BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory) BACHELOR'S DEGREE IN INDUSTRIAL DESIGN AND PRODUCT DEVELOPMENT ENGINEERING (Syllabus 2009). (Teaching unit Optional)
ECTS credits:	6
Teaching languages:	Catalan, Spanish

Teaching staff

Coordinator:	Antonijuan Rull, Josefina
Others:	JOSEP GONZALEZ ROVIRA Antonijuan Rull, Josefina Ybern Carballo, M. De Las Nieves

Prior skills

- Mastering the basic tools of differential and integral calculus of real functions in one real variable.
- Knowledge how to operate with complex numbers.
- Understanding of the factorization of polynomials with real or complex coefficients.
- Knowledge of the basic tools of linear algebra.

Degree competences to which the subject contributes

Specific:

1. CE1. Ability to solve arithmetic problems related to engineering. Aptitude to apply knowledge concerning: linear algebra, geometry, differential geometry, differential and integral calculus, differential and partial equations, numerical methods, numerical algorithms, statistics and optimization.

Teaching methodology

The theoretical foundations of the subject will be taught to the large groups, if necessary with the help of media, such as transparencies, video or computer-assisted simulations.

At the beginning of each content will be given a list of representative problems, the numerical solution if necessary, to serve as motivation for students to realize them.

Also will be proposed problems that require the use of a computer medium.

Learning objectives of the subject

The general objectives to get from the students at the end of the course are:

- o Understand and apply, if necessary using specific software, the basic techniques of differential calculus of several variables and integral calculus of several variables.
- o Understand and apply, if necessary using specific software, integration of scalar and vector fields on curved surfaces, as well as the integral theorems of Gauss and Stokes.



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Study load

Total learning time: 150h	Hours large group:	52h 30m	35.00%
	Hours medium group:	0h	0.00%
	Hours small group:	7h 30m	5.00%
	Guided activities:	0h	0.00%
	Self study:	90h	60.00%

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Content

(ENG) 1- Differential multivariable calculus	Learning time: 36h Theory classes: 9h Practical classes: 6h Self study : 21h
Description: 1.1 Conics and quadrics 1.2 Scalar functions of two variables 1.3 Partial derivatives and directional derivatives. Tangent plane and normal vector	
(ENG) 2- Applications of multivariable calculus	Learning time: 36h Theory classes: 9h Practical classes: 6h Self study : 21h
Description: 2.1 Double Integral. Change to polar coordinate 2.2 Triple Integral. Changes in cylindrical and spherical coordinates	
(ENG) 3- Integral multivariable calculus	Learning time: 42h Theory classes: 11h Practical classes: 6h Self study : 25h
Description: 3.1 Vector functions of several variables. differential operators 3.2 Curves and Surfaces. Parameterization 3.3 Line integral 3.4 Surface integral	
(ENG) 4- Applications of integral multivariable calculus	Learning time: 30h Theory classes: 7h Practical classes: 6h Self study : 17h
Description: 4.1 Stokes Theorem 4.2 Conservative Fields 4.3 Divergence Theorem	

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Planning of activities

(ENG) 1- PROBLEMS AND EXERCISES BY SPECIFIC SOFTWARE	Hours: 16h Laboratory classes: 4h Self study: 12h
(ENG) 2- EXAM OF CONTENTS 1 AND 2	Hours: 2h Guided activities: 2h
(ENG) 3- EXAM OF CONTENTS 3 AND 4	Hours: 2h Guided activities: 2h
(ENG) 4- EXAM OF CONTENTS 1, 2, 3 AND 4	Hours: 3h Guided activities: 3h

Qualification system

The course evaluation will be: or the activities 1, 2 and 3 or 1 and 4 activities.

In the first case, each activity has the following weights in the final:

- o Activity 1. Problems and exercises using specific software: 20%
- o Activity 2. Exam of Contents 1 and 2: 35%
- o Activity 3. Exam of Contents 3 and 4: 45%

And in the second case:

- o Activity 1. Problems and exercises using specific software: 20%
- o Activity 4. Exams of Contents 1, 2, 3 and 4: 80%

Activitat 4 is the only re-gradable activity

Regulations for carrying out activities

In no case is not allowed copying, breach of this rule in any of the activities involve a 0 in the note or in the corresponding final note.

Conditions and days of carrying out activities in each event will be announced in time.

The second activity will be reserved in the first week testing period of the course, which goes to the 2012-13 Academic Calendar EPSEVG.

Activity 3 and 4 will be held simultaneously in the final evaluation period has the Academic Calendar for 2012-13 EPSEVG.

At the time of the activities the student will have the statements of the two exams and decide what to do.

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Bibliography

Basic:

Antonijuan, Josefina [et. al.]. Funcions de diverses variables : curs bàsic. 2a ed. Barcelona: Edicions UPC, 2000. ISBN 8483014130.

Antonijuan, Josefina; Batlle, Carles; Boza, Santiago; Prat, Joana d'Arc. Matemàtiques de la telecomunicació [on line]. Barcelona: ETSETB, 2001 [Consultation: 07/10/2014]. Available on: <<http://hdl.handle.net/2099.3/36249>>. ISBN 8483015757.

Larson, Ron [et al.]. Cálculo. Vol. 2, Cálculo 2, de varias variables. 9a ed. México D.F. [etc.]: McGraw Hill, 2010. ISBN 9789701071342.

Marsden, Jerrold E.; Tromba, Anthony J. Cálculo vectorial [on line]. 6a ed. Madrid: Educación, 2018 [Consultation: 31/07/2019]. Available on: <https://discovery.upc.edu/iii/encore/record/C__Rb1510151?lang=cat>. ISBN 9788420568669.

Others resources:

Hyperlink

"3D CALC PLOTTER" de Paul Seeburger de Brighton Campus
<http://web.monroecc.edu/manila/webfiles/calcNSF/JavaCode/CalcPlot3D.htm>

Aplicació interactiva que permet visualitzar:

- funcions escalars de dues variables, les seves derivades parcials i direccionals i les corresponents rectes tangents, les corbes de nivell i el vector gradient,
- corbes i superfícies parametritzades.

"CALCULUS APPLETS AT SLU" del Dept. of Mathematics and Computer Science of Saint Louis University
http://www.slu.edu/classes/maymk/MathApplets-SLU.html#Understanding_surfaces_and_graphs_of

Col.lecció d'aplicacions interactives per al Càlcul de diverses variables, de les quals destaquem:

- visualització de funcions escalars de dues variables, corbes de nivell i seccions,
- visualització de corbes i superfícies,
- visualització i càlcul d'integrals de línia,
- visualització i càlcul d'integrals de superfície.