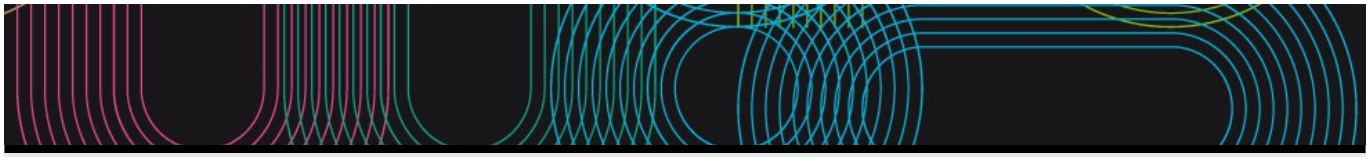

IDENTIFYING DATA				
Mathematics: Mathematics and IT				
Subject	Mathematics: Mathematics and IT			
Code	P03G370V01103			
Study programme	(*)Grao en Enxeñaría Forestal			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	9	Basic education	1st	1st
Teaching language	Spanish Galician			
Department				
Coordinator	Casas Mirás, José Manuel			
Lecturers	Casas Mirás, José Manuel			
E-mail	jmcasas@uvigo.es			
Web	http://http://faitic.uvigo.es/			
General description	The subject is programmed so that the student purchase the necessary competitions to resolve problems of mathematical nature that can present in the Forest Engineering, so that it purchase skill in the handle of programs of calculation, basic knowledges of Computing and management of the information, as well as in the handle of TIC.			

Competencies	
Code	
B1	Ability to understand the biological, chemical, physical, mathematical and representation systems necessary for the development of professional activity, as well as to identify the different biotic and physical elements of the forest environment and renewable natural resources susceptible to protection, conservation and exploitations in the forest area.
C3	Ability to solve mathematical problems that may arise in engineering. Ability to apply knowledge about: linear algebra; geometry; differential and integral calculation. Basic knowledge about computers, operating systems, databases, programming and calculation programs for use in engineering.
D2	Ability to communicate orally and written in Spanish or in English
D5	Capacity for information management, analysis and synthesis
D7	Skill in the use of IT tools and ICTs.
D8	Ability to solve problems, critical reasoning and decision making
D10	Autonomous Learning

Learning outcomes	
Expected results from this subject	Training and Learning Results

1R. 2018 Knowledge and understanding of the mathematicians and other inherent basic sciences to the his speciality in engineering, it a level that allow them purchase the rest of the competitions of the qualifications.	B1	C3	D2 D5 D7
3R. 2018 Be conscious of the multidisciplinary context of the engineering.			D8
4R. 2018 Capacity to #analyze products, processes and complex systems in the his field of study; choose and apply analytical methods, of calculation and experimental *relevantes of form *relevante and interpret correctly the results of these analyses.			D10
5R. 2018 Capacity to identify, formulate and resolve problems of engineering in the his speciality; choose and apply analytical methods, of calculation and experiments properly established; Recognize the importance of the social restrictions, of health and security, environmental, economic and industrial.			
8R. 2018 Capacity to realize bibliographic researches, consult and use databases and other sources of information with discretion, to realize @simulación and analysis with the objective to realize investigations on technical subjects of the his speciality.			
10R. 2018 Capacity and capacity to project and realize experimental investigations, interpret results and obtain conclusions in the his field of study.			
12R. 2018 practical Competition to resolve complex problems, realize complex projects of engineering and realize specific investigations stop his speciality.			
19R. 2018 Capacity to communicate of effective way information, ideas, problems and solutions in the field of the engineering and with the society in general.			
20R. 2018 Capacity to work effectively in national and international contexts, individually and in team, and cooperate with the engineers and people of other disciplines.			
21R. 2018 Capacity to recognize the need of a continuous training and realize this activity of independent way during his professional life.			
22R. 2018 Capacity to be to the day of the scientific and technological news.			

Contents

Topic	
Subjet 1. The fields of real and complex numbers	Numerical sets. The real numbers. Intervals in R. Absolute value. Extended real line. The field of complex numbers. Representation of complex numbers. Module and argument. Euler's Formula. Operations with complex numbers in polar form: powers (De Moivre's formula), roots, exponentials, logarithms.
Subject 2. Vector spaces	The vector space Rn. Vector Subspaces. Linear combination. Linear dependency and independence. Finite-dimensional vector spaces. Basis and dimension. Rank.
Subject 3. Linear applications	Linear applications. Properties. Kernel and image of a linear application. Characterization of injectives and surjectives linear applications. Rank of a linear application. Associated matrix to a linear application.
Subject 4. Matrices	Definition and types of matrices. Vector space of matrices mxn. Product of matrices. Regular matrix. Rank of a matrix. Calculation of the rank of a matrix and of the inverse matrix by means of elementary operations.
Subject 5. Determinants	Determinants of a square matrix of order 2 and of order 3. Properties. Cofators expansion. Calculation of the inverse matrix. Calculation of the rank of a matrix.
Subject 6. Systems of linear equations	Systems of linear equations: matrix form. Equivalent systems. Existence of solutions: Rouché-Frobenius' theorem. Homogeneous systems. Resolution of systems of linear equations: resolution by means of Gauss and Gauss-Jordan elimination methods. Resolution of a Cramer's system. Resolution of a general system using the Cramer's rule.
Subject 7. Euclidean vector space	Scalar product. Norm. Distance. Orthogonality. Scalar product with respect to a basis. Orthogonal and orthonormal systems. Vector product. Mixed product. Areas and volumes.
Subject 8. Geometry	Three-dimensional affine space. The straight lines in the affine space. Equations of the straight line. The plane in the affine space. Equations of the plane. Relations of incidence between straight lines and planes. Angles: of two straight lines, of two planes and of a straight line and a plane. Distances: of a point to a plane, of a straight line to a plane and of two croseed straight lines. Metric study of the conic sections.
Subject 9. Diagonalization of endomorphisms and matrices	Eigenvectors and eigenvalues. Eigensubspaces. Characteristic polynomial. Diagonalization: Conditions. Annulator polynomial. Cayley-Hamilton's theorem. Applications.
Subject 10. Convergence in R.	Convergent sequences in R. Operations with limits. Calculation of limits: indeterminations, Stolz's rule.

Subject 11. Limit and continuity of functions of a real variable	Limit of a function in a point. Sequential limit. Properties of limits. Calculation of limits. Continuity of real functions. Discontinuity: Types. Operations with continuous functions. Theorems relative to the global continuity: continuous image of a closed interval, Bolzano-Weierstrass' theorem, Bolzano's theorem: consequences. Continuity of the reverse function and of the composition of functions.
Subject 12. Differential calculus of a variable	Derivative of a function in a point. Geometric interpretation of the concept of derivative. The differential. Derived function. Successive derivatives. Relationship between continuity and derivability. Calculation of derivatives: derivative of the composition of functions and of the inverse function. Theorems relative to derivable functions: Rolle's theorem, consequences; The mean value theorem, consequences; The rule of L'Hôpital, calculation of indeterminate limits. Taylor polynomials of a function. Taylor's theorem. Maximum and minimum Problems. Study of concavity and convexity. Inflection points. Graphical representation of functions
Subject 13. Integration of functions of a variable	The Riemann integral: partitions, upper and lower sums, upper and lower integral, integral functions, the integral as sum limit. Properties. Theorem of the mean value. The fundamental theorem of integral calculus. Barrow's rule. Primitives. General methods for the calculation of primitives. Improper integrals. Geometric applications of the integral.
Subject 14. Informatics	Operating systems: classification, components, examples. Programming fundamentals. Organization of archives. Methods of sorting and searching. Concept and types of databases.
LABORATORY PRACTICE AGENDA	
Practice 1. Introduction to the syntax of a computer algebra system.	Basic commands of a computer algebra system.
Practice 2. Complex Numbers	Complex arithmetic in cartesian form. Polar form. Arithmetic in polar form
Practice 3. Vector Spaces	Operations with vectors. Linear independence of vectors and calculation of bases. Generator systems. Range of a vector system.
Practice 4. Linear Applications	Calculation of the associated matrix. Calculation of the kernel, image and rank
Practice 5. Matrices and determinants	Operations with matrices. Calculation of the determinant of a square matrix. Calculation of the rank of a matrix and the inverse matrix
Practice 6. Systems of linear equations	Resolution of linear systems. Cramer's Rule and Gauss and Gauss-Jordan Elimination Methods. Applications.
Practice 7. Euclidean Vector Space and Geometry	Calculation of the scalar product, vector product and mixed product. Calculation of areas, volumes, angles and distances.
Practice 8. Diagonalization	Calculation of the eigenvalues and eigenvectors of a square matrix. Diagonalization of matrices. Applications
Practice 9. Convergence	Limit of numerical sequences.
Practice 10. Functions	Calculation of the limit of a function at a point. Graphical representation of functions. Study of continuity.
Practice 11. Derivatives.	Derivative of functions. Calculation of tangent and normal lines. Problems of relative extremes. Developments in Taylor series. Local study of functions.
Practice 12. Integration	Calculation of primitives. Applications: calculation of areas, volumes, arc lengths, etc.
Subject 13. Informatics	Programming Fundamentals. Development and management of databases

Planning

	Class hours	Hours outside the classroom	Total hours
Introductory activities	1	0	1
Lecturing	23	34.5	57.5
Problem solving	24	36	60
Laboratory practical	28	14	42
Autonomous practices through ICT	0	10	10
Autonomous problem solving	0	14	14
Mentored work	0	14	14
Essay questions exam	4	0	4
Objective questions exam	0	7	7
Problem and/or exercise solving	0	8	8
Essay	0	7.5	7.5

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

Methodologies	
	Description
Introductory activities	Activities aimed at taking contact, gathering information about the students and presenting the subject.
Lecturing	Exhibition of contents of the subject. The exhibition will be used on the blackboard with the support of audiovisual systems and symbolic package programs.
Problem solving	Formulation, analysis, resolution and discussion of problems or exercises related to the topic of the subject. The exhibition will be used in blackboard with the support of audiovisual media and symbolic package programs.
Laboratory practical	Resolution of problems related to the theoretical contents through the use of a symbolic package program, a database management program and a text editing program.
Autonomous practices through ICT	Available resources will be used online, such as databases, and the TEMA institutional platform will be used for the development and execution of various tasks.
Autonomous problem solving	Formulation, analysis, resolution and discussion of problems or exercises related to the theme of the subject, by the students. Problems bulletins corresponding to the scheduled topics will be provided, which the student must solve by himself.
Mentored work	Autonomous tasks related to the programmed topics, which will be delivered using the TEMA platform to be evaluated.

Personalized assistance	
Methodologies	**Description**
Problem solving	Tutoring schedules will be used to guide and advise students individually in the resolution of questions or queries. Students will also be tutored via email.
Laboratory practical	Tutoring schedules will be used to guide and advise students individually in the resolution of questions or queries. Students will also be tutored via email.
Mentored work	Tutoring schedules will be used to guide and advise students individually in the resolution of questions or queries. Students will also be tutored via email.
Autonomous practices through ICT	Tutoring schedules will be used to guide and advise students individually in the resolution of questions or queries. Students will also be tutored via email.
Autonomous problem solving	Tutoring schedules will be used to guide and advise students individually in the resolution of questions or queries. Students will also be tutored via email.
Tests	**Description**
Objective questions exam	Tutoring schedules will be used to guide and advise students individually in the resolution of questions or queries. Students will also be tutored via email.
Problem and/or exercise solving	Tutoring schedules will be used to guide and advise students individually in the resolution of questions or queries. Students will also be tutored via email.
Essay	Tutoring schedules will be used to guide and advise students individually in the resolution of questions or queries. Students will also be tutored via email.

Assessment					
	Description	Qualification	Training and Learning Results		
Essay questions exam	It has two parts: 1. Final exam of theoretical contents. 2. Final exam of laboratory practices.	70	B1	C3	D2 D5 D7 D8 D10
Objective questions exam	Resolution of closed tests consisting of exercises with several alternative answers of which the student must indicate the true one. Resolution of problems in which, using a computer algebra system, they must provide the response of the program to the corresponding exercise.	10	B1	C3	D7 D8 D10
Problem and/or exercise solving	Resolution of problem bulletins and laboratory practices.	10	B1	C3	D2 D5 D7 D8 D10
Essay	Realization of open projects in which it is necessary to use different knowledge acquired throughout the course.	10	B1	C3	D2 D5 D7 D8 D10

Other comments on the Evaluation

The assessment will be carried out in two sections: assessment of theoretical contents and evaluation of laboratory practices.

The assessment of the theoretical contents: will be the sum of the final exam mark of the theoretical contents (that will have a weight of 35% in the overall assessment), continuous assessment evaluation (which will have a 15% weight in the overall evaluation).

The final exam of the theory supposes 70% of the evaluation of the theoretical contents. The continuous assessment will consist of examinations of objective questions (supposes 10% of the mark of the evaluation of the theoretical contents), proposed exercises resolution works (supposes 10% of the note of the evaluation of the theoretical contents) and the works of projects (it supposes 10% of the mark of the evaluation of the theoretical contents).

The evaluation of the laboratory practices (which will have a 50% weight in the overall assessment) will be constituted by the final exam of laboratory practices (will represent 70% of the practical note), the performance during the practical sessions carried out (will represent 10 % of the practical note), the practices delivered (they will represent 10% of the mark of practices) and the complementary works (they will represent 10% of the mark of practices).

The final grade will be the arithmetic mean of the evaluation of the theoretical contents and the evaluation of the laboratory practices. Only the average of both notes will be made if at least 4.5 are obtained in each of them. The subject was considered approved if the final average grade is at least 5.

For the July evaluation, the student will be required to repeat the procedures not obtained during the evaluation of the first call, while maintaining the assessment of the procedures already passed.

Students who duly justify the impossibility of doing to the continuous evaluation will be evaluated through the final examinations of theoretical contents and the final exam of laboratory practices.

Exam calendar:

First call: January 20, 2020, 9:30 a.m.

Second call: June 25, 2020, 4:30 p.m.

The official dates and possible modifications are set out in the official bulletin board of E. E. Forestal and posted at http://forestales.uvigo.es/gl/

Sources of information

Basic Bibliography

Complementary Bibliography

Grossman, S. I., **Álgebra Lineal con aplicaciones**, 1991,

Rojo, J., **Álgebra Lineal**, 2007,

Burgos, J. de, **Curso de Álgebra y Geometría**, 1980,

Luzarraga, A., **Problemas resueltos de Álgebra Lineal**,

Rojo, J. y Martín, I., **Ejercicios y problemas de Álgebra Lineal**, 2005,

Burgos, J. de, **Cálculo infinitesimal de una variable**, 1994,

Larson, R. E.; Hostetler, R. P. y Edwards, B. H., **Calculo Volumen I**, 2006,

Ayres, F. Jr., **Cálculo**, 2001,

Bradley, G. L. Y Smith, K. J.,, **Cálculo de una variable**, 1998,

Checa, E. y otros, **Álgebra, cálculo y mecánica para Ingenieros**, 1997,

Martínez Salas, J., **Elementos de matemáticas**, 1992,

Franco Brañas, J. R., **Introducción al cálculo: problemas y ejercicios resueltos**, 2003,

García, A.; Gracía, F.; López, A.; Rodríguez, G. y de la Villa, A., **Cálculo I: teoría y problemas de análisis matemático de una variable**, 2007,

Granero, F., **Cálculo integral y aplicaciones**, 2001,

Rodríguez Riotorto, M., **Primeros pasos en Maxima**, 2008,

Cerrada Somolinos, J. A., **Fundamentos de programación con Modula-2**, 2000,

Prieto, A.; Lloris, A. y Torres, J. C., **Introducción a la Informática**, 2006,

Plasencia López, Z., **Introducción a la Informática**, 2006,

Rodríguez Riotorto, M, **Manual de Maxima**, 2005,

Alaminos Prats, J. , Aparicio del Prado, C., Extremera Lizana, J. , Muñoz Rivas, P. y Villena Muñoz, **Prácticas de ordenador con wxMaxima**, 2008,

Recommendations

Subjects that continue the syllabus

Mathematics: Overview of mathematics/P03G370V01203

Subjects that are recommended to be taken simultaneously

Physics: Physics I/P03G370V01102

Other comments

It is recommended to have studied the mathematics subjects in the Secondary School, although many concepts will be reviewed.