Last update: 11-03-2019

390109 - FM2 - Mathematics II

Coordinating unit: 390 - ESAB - Barcelona School of Agricultural Engineering

Teaching unit: 749 - MAT - Department of Mathematics

Academic year: 2019

Degree: BACHELOR ' S DEGREE IN AGRONOMIC SCIENCE ENGINEERING (Syllabus 2018). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN FOOD ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN AGRICULTURAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN FOOD ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN AGRICULTURAL, ENVIRONMENTAL AND LANDSCAPE ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN BIOSYSTEMS ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)

ECTS credits: 6 Teaching languages: Catalan

Teaching staff

Coordinator: Blanco Abellan, Monica

Others: Boza Rocho, Santiago
Comellas Padro, Francesc De Paula
Fabregat Fillet, Jaime
Garcia Martinez, Yamila
Ginovart Gisbert, Marta
Montoro Lopez, Maria Eulalia

Degree competences to which the subject contributes

Specific:

2. Fundamentals of computer use and programming, operating systems, data bases, software for engineering applications.
3. Ability to solve mathematic problems in an engineering context . Ability to apply the knowledge of integral calculus, differential equations, numeric methods, numeric algorithms,

Generical:

1. Ability to solve problems.

Teaching methodology

The course topics are released on one-hour and two-hour lectures. In the lectures students' involvement is encouraged by means of the performance of low-stake activities in the classroom, such as asking-answering questions regarding one lecture, students presentations on specific topics, or the solving of exercises and problems related to the topics taught. The solving of exercises and problems will be performed primarily in small groups and computer labs. In these sessions students will be asked to seek appropriate solutions through the application of formulae or algorithms, the implementation of procedures to transform the available information, the interpretation of results and the use of appropriate software in the computer lab sessions.
Autonomous learning will focus on key actions aimed at solving exercises and problems. Several quizzes will be performed as self-learning activities, available on the virtual campus. There will be a written mid-semester exam. A written final global exam will be held at the end of the course.

Last update: 11-03-2019

390109 - FM2 - Mathematics II

Learning objectives of the subject

The subject Mathematics 2 addresses general formative purposes. It aims to generate learning skills and to promote the assessment of the power and usefulness of mathematical models and procedures, in order to understand and to make decisions in the techno-scientific area. Mathematics plays a fundamental role in helping to understand the techno-scientific environment and to deal with it in an autonomous and creative way. As in all the areas of mathematics, systematic and constant work, accurate reasoning and interpretation, and abstraction will be enhanced throughout the teaching-learning process.
By the end of the course the student will be able to carry out logical reasoning, to develop analytical and critical thinking, to evaluate arguments rigorously and to communicate them effectively.
The course is structured into three core topics: 1) integral calculus, 2) differential equations, and 3) numerical methods and programming. Throughout the course the emphasis is placed on problem solving and applications to branches of engineering and science.
In the area of integral calculus students will achieve fundamental concepts relating to comprehensive, and also resolve with basic methods exercises related to these applications in the case of real functions of real variable. In the area of differential equations, the purpose will be that students work with the practical aspects of solving ordinary differential equations, giving priority to applications in other branches of science and technology. Regarding partial differential equations, students get a brief overview of what they are and their use. Regarding numerical methods, the student will be introduced in the basic numerical techniques and the use of certain specific methods. Regarding the area of programming and applications students will use worksheets and specific programs to solve complex mathematical problemss.

Study load

Total learning time: 150h	Hours large group:	40h	26.67%
	Hours medium group:	0h	0.00%
	Hours small group:	20h	13.33%
	Guided activities:	0h	0.00%
	Self study:	90h	60.00%

Last update: 11-03-2019

390109 - FM2 - Mathematics II

Content

INTEGRAL CALCULUS

Learning time: 50h

Theory classes: 12h
Laboratory classes: 8h
Self study : 30h

Description:
1.1. Antiderivative (indefinite integral): definition, non-uniqueness, notation. Basic antiderivatives. Rules for antiderivation: linearity. Integration by parts, by substitution, by partial fractions.
1.2. Definite integrals (proper integrals): definition, calculation methods. Connection with surface areas.
1.3. Improper integrals: definitions. Types of improper integrals. Convergence. Connection with surface areas

Related activities:
Activity 1: Lectures.
Activity 2: Individual written.
Activity 3: Problem and exercise solving.
Activity 4: Computer Lab Sessions.
Activity 5: Questionnaires

DIFFERENTIAL EQUATIONS

Learning time: 50h

Theory classes: 14h
Laboratory classes: 6h
Self study : 30h

Description:
2.1. Ordinary differential equations (ODEs). Definitions and basic concepts. Separable ordinary differential equations. Homogeneous ordinary differential equations. First-order linear ordinary differential equations. Second-order linear ordinary differential equations with constant coefficients.
2.2. Systems of first-order linear ordinary differential equations with constant coefficients.
2.3. Partial differential equations.

Related activities:
Activity 1: Lectures.
Activity 2: Individual written test.
Activity 3: Problem and exercise solving.
Activity 4: Computer Lab Sessions.
Activity 5: Questionnaires

Last update: 11-03-2019

390109 - FM2 - Mathematics II

NUMERICAL METHODS AND PROGRAMMING	Learning time: 50h Theory classes: 14h Laboratory classes: 6h Self study : 30h

Description:
3.1. Numerical methods. Numerical solution of equations (one and several variables). Numerical integration. Numerical solution of differential equations.
3.2. Programming and applications.

Related activities:
Activity 1: Lectures.
Activity 2: Individual written test.
Activity 3: Problem and exercises solving.
Activity 4: Computer Lab Sessions.
Activity 5: Questionnaires

Last update: 11-03-2019

390109 - FM2 - Mathematics II

Planning of activities

ACTIVITY 1. LECTURES	Hours: 97h Theory classes: 38h Self study: 59h

ACTIVITY 2. INDIVIDUAL WRITTEN TEST	Hours: 2h Theory classes: 2h

Support materials:
Calculator. One formulae sheet.

Descriptions of the assignments due and their relation to the assessment:
Mid-term exam: 30% of the final grade.
Final exam: 45% of the final grade.

ACTIVITY 3. EXERCISES AND PROBLEM SOLVING	Hours: 20h Laboratory classes: 10h Self study: 10h

Support materials:
Course material available at Atenea.

ACTIVITY 4. COMPUTER LAB SESSIONS	Hours: 15h Laboratory classes: 10h Self study: 5h

Support materials:
Course material available at Atenea.

ACTIVITY 5: QUESTIONNAIRES	Hours: 16h Self study: 16h

Description:
Individual, distance learning activity. Each questionnaire takes at most two hours.

Support materials:
Available at the virtual campus Atenea.

Descriptions of the assignments due and their relation to the assessment:
5% of the final grade.

Last update: 11-03-2019

390109 - FM2 - Mathematics II

Qualification system

N1: The continuous assessment will be developed mainly in the context of small groups and computer lab sessions.
N2: There will be several questionnaires throughout the course.
N3: There will be a mid-semester written exam.
N4: There will be a final (global) written exam at the end of the semester.
CG: Assessment of the first level of the generic competence.

The final mark (Nfinal) will be computed as follows:

Nfinal = 0.15 N1 + 0.05 N2 + 0.30 N3 + 0.45 N4 + 0.05 CG

Students who fail to pass the course can sit for the written exams N3 and N4 in the reassessment exam period.

Bibliography

Basic:

Borrelli, R.; Coleman, C.S. Ecuaciones diferenciales. Una perspectiva de modelación. Mèxic: Oxford University Press, 2002.

Gerald, C.F.; Wheatley, P.O. Análisis numérico con aplicaciones. 6a ed. Mèxic: Pearson Educación, 2000. ISBN 9684443935.

Zill, D.G. Ecuaciones diferenciales con aplicaciones de modelado. 6a ed. Mèxic: International Thomson Editores, 1997. ISBN 9687529210.

Ayres, Frank; Mendelson, Elliott; Abellanas, Lorenzo. Cálculo diferencial e integral. 3ª ed. Madrid: McGraw-Hill, 1991. ISBN 8476155603.

Boyce, William E.; DiPrima, Richard C. Ecuaciones diferenciales y problemas con valores en la frontera. 5ª ed.. México: Limusa Wiley, 2010. ISBN 9786070501517.

Complementary:

Fabregat Fillet, Jaume; Ros, Rosa M. Equacions diferencials ordinàries de primer ordre. Barcelona: Universitat Politècnica de Catalunya, 1991. ISBN 8476531117.

Gibergans Bàguena, Josep. Matemáticas para la ingeniería con Maple. Barcelona: Edicions UPC, 2008. ISBN 9788483019672.