Bachelor in Computer Engineering

Course information

Year 2021-22

GENERAL SPECIFICATIONS				
English name				
Mathematics I				
Spanish name				
Matemáticas I				
Code		**Type**		
606010101		Basic		
Time distribution				
	Total	**In class**	**Outside class**	
Working hours	150	60	90	
ECTS:				
Standard group	**Small groups**			
	Classroom	**Lab**	**Practices**	**Computer classroom**
4.44	0	0	0	1.56
Departments		**Knowledge areas**		
Integrated Sciences		Applied Mathematics		
Year		**Semester**		
1st – First		First Semester		

TEACHING STAFF			
Name	**E-Mail**	**Telephone**	**Office**
Aurentz, Jared	jared.aurentz@dci.uhu.es	959219926	Experimental Sciences 3.3.15

SPECIFIC INFORMATION OF THE COURSE
1. Contents description
1.1. In English:
Differential Calculus: fundamental concepts, polynomial approximation, numerical methods. Integral Calculus: analytic methods, numerical methods. Applications.
1.2. In Spanish
Cálculo Diferencial: conceptos fundamentales, aproximación polinómica, métodos numéricos. Cálculo Integral: métodos analíticos, métodos numéricos. Aplicaciones.
2. Background
2.1.Situation within the Degree:
Foundational, first semester course.
2.2. Recommendations:
Students should have a basic understanding of standard mathematical operations, elemental functions and the concepts of limits, continuity and derivatives.
3. Objectives (as result of teaching):

General:
Introduction to abstract reasoning y development of fundamental mathematical skills. Capacity to express mathematically scientific problems, solve them using the correct mathematical techniques and correctly interpret the results. Appreciation for mathematics as an essential tool for deeper scientific understanding.

Methodology:
Introduce the student to mathematical notation and the mathematical way of thinking and solving problems. Capacity to solve basic, real-world mathematical problems.

4. Skills to be acquired

4.1. Specific Skills:

- **CB01:** Capacity to solve mathematical problems typical in engineering. Ability to apply knowledge of: linear algebra, differential and integral calculus, numerical methods, numerical algorithms, statistics and optimization.

4.2. General Skills:

- **CB1:** That the student demonstrates possession and comprehension in an area beyond secondary education that, with the help of text books, includes understanding at the forefront of their area of study.
- **G02:** Communicating orally and through writing in an academic and professional setting, with an emphasis in preparing technical documents.
- **G03:** Problem solving.
- **G04:** Objective decision-making, based on experimental or simulated data. Ability to debate and defend logically these decisions and accept other points of view.
- **G05:** Ability to work in teams.
- **G06:** Ability to work independently and take the initiative.
- **G09:** Ability to innovate and generate new ideas.
- **CT2:** Develop critical-thinking skills with the ability to analyze and synthesize.
- **CT3:** Develop research skills that permit the continual reflection and advancement of knowledge.

5. Training Activities and Teaching Methods

5.1. Training Activities:

- Lectures on theoretical material.
- Problem-solving sessions.
- Programming sessions.
- Professor-led activities: seminars, conferences, work development, debates, group tutoring, evaluation and self-evaluation.

5.2. Teaching Methods:

- Lectures.
- Problem-solving in computer labs.
- Practice problems.
- Office hours.
- Planning, completing, tutoring and presentation of individual work.
- Exams.

5.3. Development and Justification:

Lectures on theory and problem-solving:
Precisely develop theoretical concepts, omitting most of the proofs. This way not only facilitates learning, but also leaves more time for solving examples and answering questions.

Small-group sessions:
Practice applying theoretical concepts to solve problems. Develop individual problem-solving skills.

Computer lab sessions:
Introduction to MATLAB and how to use it to solve problems.

6. Detailed Contents:

Theme 1: Complex Numbers
Basic definitions. Arithmetic with complex numbers. Applications.
Theme 2: Continuity of Real-valued Functions
Review of the concepts of function, limit and continuity.
Theme 3: Differentiability of Real-valued Functions
Differentiability. Fundamental Theorem of Differential Calculus. Applications.
Theme 4: Function Approximation and Taylor Series.
Taylor polynomials. Taylor Series. Error estimation. MacLaurin Series. Approximation of elemental functions. Applications.
Theme 5: Methods of Integration
Primitive functions. Indefinite integrals. Properties. Instant integrals. Basic methods of integration.
Theme 6: Definite and Improper Integrals
Area under a curve. Riemann integration. Integrability. Properties. Mean value theorem. Fundamental Theorem of Integral Calculus. Indefinite integrals: Barrow's Rule. Change of variable. Integrals in unbounded intervals. Integrals of unbounded functions. Convergence.
Theme 7: Applications of Integration
Calculate area, volume, revolved surfaces and arc-length. Applications in Physics.
Theme 8: Numerical Series
Infinite sums. Convergente and Divergente series. Series of positive terms: bounding criteria and convergence. Absolute convergence. Power series of elemental functions.
Theme 9: Multivariable Functions
Limits. Properties. Continuity. Differentiability.

7. Bibliography

7.1. Basic Bibliography

- Burgos J. De: Cálculo Infinitesimal de una Variable. Ed. Mcgraw-Hill (1994).
- Fernández Viñas, J.A.: Análisis Matemático I. Ed. Tecnos (1986).
- Franco Brañas J. R.: Introducción al Cálculo. Problemas y Ejercicios resueltos. Ed. Prentice (2003).

7.2. Additional Bibliography:

- Burgos J. De: Cálculo de una Variable Real. Ed. García Maroto (2009).
- Edwards C.H., Penney D.E.: Cálculo Diferencial e Integral. 4ª ed. Ed. Pearson

Educación, (1997).

- García A. y otros: Cálculo I. Teoría y problemas de Análisis Matemático en una variable. 2ª ed.Ed. Clagsa, (1994).
- Larson, Hostetler, Edwards: Cálculo I. 7ª ed. Ed. Pirámide, (2002).
- Purcell, Varberg, Pigdon: Cálculo, 8ª ed. Prentice-Hall, (2001).
- Salas-Hille: Calculus, tomos I y II, 3ª ed. Ed. Reverté, (1999).

8. Systems and Assessment Criteria

8.1. System for Assessment:

- Theoretical exam
- Defense of projects and written works
- Individual progress activities
- Practical exam

8.2. Assessment Criteria and Marks:

The evaluation and qualification of the course, in each round of examination, will be realized according to the following rules:

1st Round of Examination: One exam on theory on the date specified by the Escuela Técnica Superior de Ingeniería, as well as two practical exams in the computer lab. The first one will take place roughly at the midpoint of the semester, once Theme 4 is finished. The second will take place in the last week of the semester. The grade for the practical portion of the course will be the average of these two exams. The student will also be required to submit written reports related to the practice sessions in order to evaluate their individual progress.

2nd and 3rd Rounds of Examination: In both rounds their will be one exam on theory and another practical exam to take place on the date specified by the Escuela Técnica Superior de Ingeniería.

Those students who choose one-time evaluation, according to the rules established by the University of Huelva, will take a single practical exam on the same day as the exam on theory. A survey will be opened during the first two weeks of the semester, in the Moodle website associated to the course, where the students can choose whether they prefer one-time or continuous evaluation. After these two weeks, any student who wishes to switch to one-time evaluation must obtain written consent from the Professor of the course.

Exceptional Round for Students About to Graduate: Their will be one exam on theory and another practical exam to take place on the date specified by the Escuela Técnica Superior de Ingeniería.

General Rules:

- In each practical exam the student will be asked to solve a collection of practical problems related to the course material with the help of the same software used in the computer lab small-group sessions. In each exam on theory the student will be asked to solve a collection of problems, examples or theoretical questions related to the course material. Each practical exam will last no more than 2 hours and each exam on theory will last no more than 4 hours.
- The grade obtained from the exam on theory will count for 75% of the final grade. The average grade obtained from the practical exams will count towards 20% of the final grade. The individual progress activities will count towards 5% of the final grade.
- In order to pass the course in each round of exams the student will need to obtain a minimum grade of 3 in the exam on theory, a minimum grade of 3 in the practical

exam and an average grade of at least 5. The final grade of the students whose individual grades do not meet the minimums just described will be the minimum of 4.5 y the calculated final grade.

- Unless the student wishes otherwise, a grade of 5 or more in any of the exams in the 1st round of examination will be valid during the 2nd round of examination. After the 2nd round of examination the student must retake all exams (theory and practical) in future rounds of examination.
- In all of the evaluation activities, including exams, the professors will be evaluating the clarity of expressed theoretical concepts, the interpretation of results obtained, the conciseness of the answers, the ability to correctly apply each concept and the precision of any calculations, in accordance with skills CB01, G02, G03, G04, G05 and G09.
- In order to obtain the qualification “Matricula of Honor” it will be necessary, though not sufficient, for the student to obtain a final grade of 9.5 or higher. In the case of a tie the students with the highest grade in the theoretical exam will be ranked first.