SUBJECT TEACHING GUIDE

G584 - Mathematical Methods in Engineering

Degree in Energy Resources Engineering

Academic year 2023-2024

1. IDENTIFYING DATA

Degree	Degree in Energy Resources Engineering		Type and Year	Core. Year 2
Faculty	School of Mines and Energy Engineering			
Discipline	Subject Area: Mathematics Basic Training Module			
Course unit title and code	G584 - Mathematical Methods in Engineering			
Number of ECTS credits allocated	6	Term	Semester based (1)	
Web				
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. MATEMATICA APLICADA Y CIENCIAS DE LA COMPUTACION
Name of lecturer	DIEGO RUIZ ANTOLIN
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Other lecturers	SARA PEREZ CARABAZA

3.1 LEARNING OUTCOMES

- Solve non-linear equations
  - Interpolate and approximate functions and numerical data
  - Numerical integrals and derivatives
  - Use the most adequate methods to solve systems of linear equations
  - Model and solve basic scientific and technical mathematical problems
  - Model basic optimization problems of practical use in engineering
  - Identify the most adequate techniques to solve optimization problems
  - Solve linear programming problems
  - Knowledge and computation of the most important statistical measures
  - Compute probabilities of outcomes in practical problems
  - Use random variables, recognizing their value to model many practical phenomena
  - Recognize practical situations where the most common probability distributions arise

4. OBJECTIVES
The overall aim of the course is an introduction to numerical methods, optimization and statistical data analysis
Introduce the students to mathematical problem solving techniques using a computer and applied to modelling scientific and technical problems.
Use statistics to characterize the variability and quantify random processes

6. COURSE ORGANIZATION	
CONTENTS	
1	Statistics
1.1	Descriptive statistics
1.2	Probability
1.3	Random variables
1.4	Common probability models
2	Numerical methods
2.1	Introduction
2.2	Numerical solution to non-linear equations
2.3	Numerical interpolation, integration and differentiation
2.4	Numerical solution to systems of non-linear equations
3	Optimization
3.1	Linear programming and optimization

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Programming work	Work	No	No	10,00
Periodic exams	Written exam	No	No	20,00
Exam of the first part of the subject corresponding to Statistics (theory and practical problems)	Written exam	No	Yes	20,00
Exam of the second and third parts of the subject corresponding to Numerical Analysis and Optimization (theory and practical problems)	Written exam	Yes	Yes	50,00
TOTAL				100,00

Observations
There will be two exams for the three different parts of the subject. One of them will test the contents of the part corresponding to Statistics and the other one will be about the part corresponding to Numerical Methods and Optimization. The first exam will take place shortly after the end of the first part of the subject.

Observations for part-time students
Part-time students can take both parts of the final exam at the end of the semester. The rest of the assessment methods will take place as for the rest of the students.

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

Chapra S. y Canale R. (2010) "Numerical Methods for Engineers". McGraw-Hill Science/Engineering/Math.
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Luceño, A., González, F.J. (2003) "Métodos Estadísticos para Medir, Describir y Controlar la Variabilidad". Serv. Public. Universidad de Cantabria. <http://catalogo.unican.es/cgi-bin/abnetopac/?TITN=214714>

Cobo, Angel (1995). "Optimización Matemática". Ed. Angel Cobo Ortega, Univ. de Cantabria.
<http://catalogo.unican.es/cgi-bin/abnetopac/?TITN=124088>