

SUBJECT TEACHING GUIDE

G585 - Extension Of Mathematics

Degree in Energy Resources Engineering

Academic year 2019-2020

| 1. IDENTIFYING DATA | | | | | |
|----------------------------------|--|------------------|--------------------|------------------|--------------------|
| Degree | Degree in Energy Resources Engineering | | | Type and Year | Compulsory. Year 2 |
| Faculty | | | | | |
| Discipline | Subject Area: Advanced Basic Training Module: Training in Common with the Mining Branch | | | | |
| Course unit title and code | G585 - Extension Of Mathematics | | | | |
| Number of ECTS credits allocated | 6 | Term | Semester based (2) | | |
| Web | http://moodle.unican.es | | | | |
| Language of instruction | Spanish | English Friendly | Yes | Mode of delivery | Face-to-face |

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| Department | DPTO. MATEMATICA APLICADA Y CIENCIAS DE LA COMPUTACION |
| Name of lecturer | MARIA DOLORES FRIAS DOMINGUEZ |
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| Other lecturers | |

3.1 LEARNING OUTCOMES

- Critically analyse the characteristics of a population from a sample. Apply the fundamental properties of the punctual estimators and confidence intervals.
- Perform statistical quality control.
- Manage the concept of multiple integral of Riemann and its application to problems of Physics and Engineering. Use symbolic calculus software to solve problems of calculation of volumes, areas, centers of gravity.
- Apply the Fourier analysis and express a function by a series of trigonometric functions.
- Classify and solve some types of first-order differential equations.
- Solve differential equations of second order, linear and constant coefficients, homogeneous and not homogeneous. Apply the Laplace transform to solve this type of differential equations.
- Know some second order partial differential equations.
- Use of specific software for the resolution of different problems.

4. OBJECTIVES

- Familiarize the students thoroughly in the required statistical tools to apply inference studies from a sample.
- Introduce students to statistical quality control and applications.
- Know how to sketch curves, surfaces and volumes, in three-dimensional space, defined by implicit or parametric equations, in rectangular, polar or cylindrical coordinates.
- Know how to express a curve as a vector function of a variable and calculate its length from its differential.
- Learn to calculate curvilinear integrals, double and triple integrals of curves, surfaces and volumes, respectively, in order to obtain geometric or physical characterizations. Example: calculation of work of a force, mass of a rod, areas, volumes, geometric center and center of mass.
- Know the theory and applications of Fourier Analysis and the Laplace Transform.
- Learn to solve simple differential equations of first and second order by analytical and numerical methods.
- Know the modeling through differential equations of different processes in physics, engineering, economics, biology. Solve these equations and represent and analyze the solution.
- Know some equation in partial derivatives of second order.
- Deepen the management of specific software as a basic tool for calculus and statistical analysis.

6. COURSE ORGANIZATION

CONTENTS

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|---|---|
| 1 | Part I: Confidence intervals and statistical quality control Theme 1: Inference and hypothesis testing Theme 2: Statistical quality control |
| 2 | Part II: Integral calculus Theme 3. Curves and surfaces Theme 4. Double and triple integrals Theme 5. Theory of vector fields |
| 3 | Part III: Fourier series, Fourier and Laplace transforms Theme 6 Fourier series, Fourier and Laplace transforms |
| 4 | Part IV: Differential equations. Theme 7. First order differential equations Theme 8. Second order ordinary differential equations Theme 9. Numerical resolution of initial value problems Theme 10. Introduction to partial differential equations |

7. ASSESSMENT METHODS AND CRITERIA

| Description | Type | Final Eval. | Reassessn | % |
|--|-----------------------|-------------|-----------|--------|
| Practical sessions | Laboratory evaluation | No | No | 16,00 |
| Tests | Written exam | No | Yes | 24,00 |
| Written exam 1 | Written exam | No | Yes | 30,00 |
| Written exam 2 | Written exam | Yes | Yes | 30,00 |
| TOTAL | | | | 100,00 |
| Observations | | | | |
| Students can only do exams in the supplemental period when they get a mark lower than 5 over 10 points. | | | | |
| Observations for part-time students | | | | |
| Part-time students can do the practical exams individually if they ask for it at the beginning of the subject. They can also do the writing exams all together in the regular session. | | | | |

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

- Castillo, E.; Pruneda, R.E. 2001. "Estadística Aplicada". Albacete: Moralea. ISBN: 978-84-923157-4-1.
<http://catalogo.unican.es/cgi-bin/abnetopac/?TITN=185711>
- Luceño, A.; González, F.J. 2004. "Métodos estadísticos para medir, describir y controlar la variabilidad". Santander : Servicio de Publicaciones de la Universidad de Cantabria. ISBN: 84-8102-375-2.
<http://catalogo.unican.es/cgi-bin/abnetopac/?TITN=127136>
- Marsden, J.E.; Tromba, A.J. 1998. "Cálculo Vectorial". Wilmington, Delaware: Addison-Wesley Iberoamericana. ISBN: 0-201-04604-0
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- Larson, R.; Hostetler, R.P.; Edwards, B.H. 2006. "Cálculo". México: McGraw-Hill. ISBN: 970-10-5274-9
<http://catalogo.unican.es/cgi-bin/abnetopac/?TITN=235642>
- Simmons, G.F.; Robertson, J.S. 1993. "Ecuaciones diferenciales: con aplicaciones y notas históricas". McGraw-Hill. ISBN: 84-481-0045-X
<http://catalogo.unican.es/cgi-bin/abnetopac/?TITN=81598>