

SUBJECT TEACHING GUIDE

G985 - Mathematical Methods for Engineering

First Degree in Industrial Electronic Engineering and Automatic Control Systems

Academic year 2025-2026

| 1. IDENTIFYING DATA | | | | | |
|----------------------------------|--|------------------|--------------------|------------------|--------------|
| Degree | First Degree in Industrial Electronic Engineering and Automatic Control Systems | | | Type and Year | Core. Year 2 |
| Faculty | School of Industrial Engineering and Telecommunications | | | | |
| Discipline | Subject Area: Mathematics Basic Training Module | | | | |
| Course unit title and code | G985 - Mathematical Methods for Engineering | | | | |
| Number of ECTS credits allocated | 6 | Term | Semester based (1) | | |
| Knowledge Field | Industrial engineering, mechanical engineering, automation engineering, industrial organization engineering and navigation engineering | | | | |
| Web | | | | | |
| Language of instruction | Spanish | English Friendly | No | Mode of delivery | Face-to-face |

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|------------------|---|--|--|--|--|
| Department | DPTO. MATEMATICA APLICADA Y CIENCIAS DE LA COMPUTACION | | | | |
| Name of lecturer | PAULA CAMUS BRAÑA | | | | |
| E-mail | paula.camus@unican.es | | | | |
| Office | E.T.S. de Ingenieros de Caminos, Canales y Puertos. Planta: + 1. DESPACHO PROFESORES (1027) | | | | |
| Other lecturers | MARIA DOLORES FRIAS DOMINGUEZ SARA PEREZ CARABAZA DIEGO RUIZ ANTOLIN | | | | |

| 4. OBJECTIVES | |
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| Introduce students to mathematical problem solution techniques, making use of numerical and statistical methods applied to model scientific and technical problems | |
| The student must learn how to use mathematics to solve problems that arise in physics and engineering. | |

| 6. SUBJECT PROGRAM | |
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| CONTENTS | |
| 1 | Part I: Statistics |
| 1.1 | Descriptive statistics: Sample and population. Type of data. Tables of frequency, statistics and graphs. |
| 1.2 | Probability and random variable: Definition and properties. Conditional probability. Independence of events. Discrete and continuous random variables. Probability, density, and distribution functions. |
| 1.3 | Common probability distributions: Common discrete and continuous distributions. Approximations using the normal distribution. |
| 1.4 | Statistical Quality Control: Introduction to statistical quality control. Control charts. |
| 2 | Part II: Numerical Method and Optimization |
| 2.1 | Basic computer arithmetic |
| 2.2 | Approximate solution for non-linear equations |
| 2.3 | Polynomial approximation of real-values functions. Optimization. |
| 2.4 | Numerical integration. |
| 2.5 | Numerical integration of Ordinary Differential Equations |

| 7. ASSESSMENT METHODS AND CRITERIA | | | | |
|--|--|-------------|-----------|---------------|
| Description | Type | Final Eval. | Reassessn | % |
| Part I: Statistics | Written exam | No | Yes | 15,00 |
| Part I: Statistics | Written exam | No | Yes | 10,00 |
| Part I: Statistics | Laboratory evaluation | No | No | 10,00 |
| Part II: Numerical Methods | Activity evaluation with Virtual Media | No | Yes | 30,00 |
| Part II: Numerical Methods | Laboratory evaluation | Yes | Yes | 35,00 |
| TOTAL | | | | 100,00 |
| Observations | | | | |
| <p>The final grade for the course will be obtained as a weighted average of all previous assessment activities (Statistics block - 35%, Numerical Methods block - 65%), provided that the final grade for each block is greater than or equal to 3 out of 10.</p> <p>The extraordinary exam will consist of two distinct parts, one for each block of the course, with each part having the same weight as the recoverable parts of the corresponding block.</p> <p>During the extraordinary exam period, students may only take the exams for the recoverable assessments they have failed.</p> <p>The grades obtained during the course are kept until the extraordinary exam session.</p> | | | | |
| Observations for part-time students | | | | |
| <p>Part-time students (and only them) will be able to take the written exams simultaneously during the established exam period if they request it at the beginning of the course.</p> <p>Attendance at lab exams is mandatory to ensure the evaluation of the same knowledge and skills as their classmates.</p> <p>The assignments proposed throughout the course can be done individually and submitted electronically.</p> | | | | |

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

Chapra S.C.; Canale L. 2015. "Métodos Numéricos para Ingenieros". Ed. McGraw-Hill. ISBN: 9781456267346
<https://go.exlibris.link/jHfjZG7N>

Mathews J., Kurtis D. 1999. "Métodos Numéricos con MATLAB". Prentice Hall. ISBN: 84-8322-181-0
<https://catalogo.unican.es/cgi-bin/abnetopac?TITN=163396>

Luceño, A.; González, F.J. 2003. "Métodos Estadísticos para Medir, Describir y Controlar la Variabilidad". Santander: Universidad de Cantabria. ISBN: 978-84-8102-750-1.
<http://catalogo.unican.es/cgi-bin/abnetopac/?TITN=214714>

Cohen, Y.; Cohen, J.Y. 2008. "Statistics and data with R: an applied approach through examples". Chichester:: John Wiley & Sons. ISBN: 978-0-470-75805-2.
<http://catalogo.unican.es/cgi-bin/abnetopac/?TITN=292113>