Course guide
295904 - FGED - Green Functions and Linear Differential Equations: Diffusive Problems, Static Inverters

Unit in charge: Barcelona East School of Engineering
Teaching unit: 749 - MAT - Department of Mathematics.

Degree:
BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN MATERIALS ENGINEERING (Syllabus 2010). (Optional subject).

Academic year: 2023  ECTS Credits: 6.0  Languages: Catalan, Spanish

LECTURER
Coordinating lecturer: Encinas Bachiller, Andres Marcos
Others: Segon quadrimestre:
ANGELES CARMONA MEJIAS - M11
ANDRES MARCOS ENCINAS BACHILLER - M11
M. JOSÉ JIMÉNEZ JIMÉNEZ - M11

PRIOR SKILLS
It is advisable to have passed the subject of Càlcul Numèric i Equacions Diferencials

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES
Specific:
CEB-01. Solve mathematical problems that may arise in engineering. Apply knowledge of linear algebra; geometry; differential geometry; differential and integral calculus; differential equations and partial differential equations; numerical methods; numerical algorithms; statistics and optimisation.

Generical:
CG-03. (ENG) Conocimiento en materias básicas y tecnológicas, que les capacite para el aprendizaje de nuevos métodos y teorías y les dote de versatilidad para adaptarse a nuevas situaciones.
CG-04. (ENG) Capacidad de resolver problemas con iniciativa, toma de decisiones, creatividad, razonamiento crítico y de comunicar y transmitir conocimientos, habilidades y destrezas en el campo de la Ingeniería Industrial.

Transversal:
07 AAT N3. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.

TEACHING METHODOLOGY
- 2 hour lectures (approximately): the teacher will describe basic concepts and materials, will give examples and will propose exercises.
- 1 hour (approximately) of the weekly class time will be devoted to solving problems proposed both in class and in the course's ancillary material. Students are required to actively participate in these classes.
- 1 hour, students will be carrying out complementary activities at computer classroom
LEARNING OBJECTIVES OF THE SUBJECT

The objective of this course is to present the concept of solving a linear differential equation of one or several variables under concentrated actions, and how to use this type of solutions to obtain the response to distributed actions. Also, we will focus on the problem of obtaining the coefficients of the equations involved from the knowledge of the corresponding Green function. We will study actual problems of interest in all the degrees taught in the EEBE, which include static problems, diffusive and undulatory problems.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self study</td>
<td>90,0</td>
<td>60.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>15,0</td>
<td>10.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>45,0</td>
<td>30.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h

CONTENTS

- **Green function for initial value problems in one dimension**

  **Description:**

  **Specific objectives:**
  Construction of Green’s function in compartmental problems. Construction of the response function in RC, RL, RLC circuits and in oscillators.

  **Full-or-part-time:** 25h
  - Theory classes: 5h
  - Practical classes: 2h 30m
  - Laboratory classes: 2h 30m
  - Self study: 15h

- **Boundary value problems of second and fourth order.**

  **Description:**

  **Specific objectives:**
  Construction of Green’s function in problems of transverse bending of ropes and beams, and longitudinal bars. Calculation of vibration frequencies and associated harmonics.

  **Full-or-part-time:** 50h
  - Theory classes: 10h
  - Practical classes: 5h
  - Laboratory classes: 5h
  - Self study: 30h
Vectorial Calculus and Green's formulae

Description:

Specific objectives:
To identify the problems related to static, diffusive and wave phenomena. Physical interpretation of different boundary conditions.

Full-or-part-time: 25h
Theory classes: 5h
Practical classes: 2h 30m
Laboratory classes: 2h 30m
Self study: 15h

Green's functions for problems in several variables

Description:

Specific objectives:

Full-or-part-time: 50h
Theory classes: 10h
Practical classes: 5h
Laboratory classes: 5h
Self study: 30h

GRADING SYSTEM

The Grade is calculated through continuous assessment through the presentation of work, exercises and laboratory practices.
Problems: 25%
Jobs: 50%
Laboratory: 25%

BIBLIOGRAPHY

Basic: