

## SUBJECT TEACHING GUIDE

### 703 - Failure Analysis

#### Master's Degree in Integrity and Durability of Materials, Components and Structures

Academic year 2023-2024

| 1. IDENTIFYING DATA              |   |                  |                    |                  |                    |
|----------------------------------|---|------------------|--------------------|------------------|--------------------|
| Degree                           | Master's Degree in Integrity and Durability of Materials, Components and Structures |                  |                    | Type and Year    | Compulsory. Year 1 |
| Faculty                          | School of civil Engineering   |                  |                    |                  |                    |
| Discipline                       |   |                  |                    |                  |                    |
| Course unit title and code       | 703 - Failure Analysis  |                  |                    |                  |                    |
| Number of ECTS credits allocated | 4   | Term             | Semester based (2) |                  |                    |
| Web                              |   |                  |                    |                  |                    |
| Language of instruction          | Spanish   | English Friendly | Yes                | Mode of delivery | Face-to-face       |

|                  |  |  |  |  |  |
|------------------|--|--|--|--|--|
| Department       | DPTO. CIENCIA E INGENIERIA DEL TERRENO Y DE LOS MATERIALES                       |  |  |  |  |
| Name of lecturer | SERGIO CICERO GONZALEZ   |  |  |  |  |
| E-mail           | sergio.cicero@unican.es  |  |  |  |  |
| Office           | E.T.S. de Ingenieros de Caminos, Canales y Puertos. Planta: + 0. DESPACHO (0006) |  |  |  |  |
| Other lecturers  | ROBERTO LACALLE CALDERON   |  |  |  |  |

### 3.1 LEARNING OUTCOMES

- Knowledge  
Habillities  
Aptitudes  
Additional competences

### 4. OBJECTIVES

## 6. COURSE ORGANIZATION

| CONTENTS |   |
|----------|---|
| 1        | Introduction to Failure Analysis                            |
| 2        | Fracture, Fatigue, Creep, and SCC in Failure Analysis       |
| 3        | Failure Analysis tools                                      |
| 4        | Case Studies (including 2.0 hours in evaluation activities) |

## 7. ASSESSMENT METHODS AND CRITERIA

| Description   | Type         | Final Eval. | Reassessn | %      |
|---|--------------|-------------|-----------|--------|
| Personal report   | Work         | No          | Yes       | 40,00  |
| Course project  | Others       | No          | Yes       | 20,00  |
| Evaluation test   | Written exam | No          | Yes       | 40,00  |
| TOTAL   |              |             |           | 100,00 |
| Observations  |              |             |           |        |
| 40% individual course project<br>20% exposition of course project<br>40% final test |              |             |           |        |
| Observations for part-time students   |              |             |           |        |
| Part-time students may follow UC evaluation guidelines for such circumstances       |              |             |           |        |

**8. BIBLIOGRAPHY AND TEACHING MATERIALS****BASIC**

Como material fundamental del curso se utiliza un texto o apuntes elaborados por el profesor de la asignatura que recoge los contenidos esenciales de la misma. También se utiliza un conjunto de artículos científicos que recogen casos prácticos resueltos que servirán para introducir a los alumnos en el proceso de análisis. Todos ellos se pondrán a disposición de los alumnos en el aula virtual.

Además, los estudiantes podrán utilizar los libros especializados de consulta ubicados tanto en la biblioteca general de los correspondientes campus universitarios como en los seminarios de los departamentos o áreas de conocimiento respectivos. Se citan a continuación un conjunto de publicaciones de consulta disponibles sobre los temas que componen la asignatura:

- Annual Book of ASTM Standards, Section 03.01. ASTM International, 1990.
- Das, A.K., Metallurgy of Failure Analysis, McGraw-Hill Professional, 1997.
- Duga, JJ. et al., Economic effects of fracture in the United States. Part 2. A report to NBS by Battelle Columbus Laboratories, 1983
- Milne, I., Engineering Failure Analysis, Vol. 1, Issue 3, 1994, pp. 171–181
- Carper, K.L., Learning from failures. In: K.L. Carper, Editor, Forensic Engineering, Elsevier, 1989, pp. 14–31
- Tada, H., Paris, P.C., Irwin, G.R., The Stress Analysis of Cracks Handbook, 2nd Edition, Paris Productions, Inc., St. Louis, 1985
- Murakami, Y., Stress Intensity Factors Handbook, Pergamon Press, New York, 1987
- Irwin, G.R., Trans. J. Appl. Mech. Vol. 24, 1958, pp. 361-364
- Anderson T. L., Fracture Mechanics: Fundamentals and Applications, 2nd edition, CRC Press, Boca Raton, 1995
- Broek, D., Elementary Engineering Fracture Mechanics, 3rd Edition, Martinus Nijhoff, The Hague, 1982
- The “Alexander L Kielland” accident, Norwegian Public Reports, Oslo, 1981
- Final report on the MV Estonia disaster – on the capsizing on 28 September 1994 in the Baltic sea of the Ro-Ro passenger vessel, The Joint Accident Investigation Commission, Republic of Estonia, 1997.
- Chapman, J.C., Collapse of the Ramsgate walkway. The Structural Engineer, Vol. 76, Issue 1, 1998, pp. 1–10