



## IDENTIFYING DATA

### Cybersecurity in Industrial Environments

|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                 |          |      |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------|
| Subject             | Cybersecurity in Industrial Environments                                                                                                                                                                                                                                                                                                                                                                                                        |          |      |
| Code                | V05M175V01209                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |      |
| Study programme     | Máster Universitario en Ciberseguridad                                                                                                                                                                                                                                                                                                                                                                                                          |          |      |
| Descriptors         | ECTS Credits                                                                                                                                                                                                                                                                                                                                                                                                                                    | Type     | Year |
|                     | 3                                                                                                                                                                                                                                                                                                                                                                                                                                               | Optional | 1st  |
| Teaching language   | Spanish                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |      |
| Department          |                                                                                                                                                                                                                                                                                                                                                                                                                                                 |          |      |
| Coordinator         | Diaz-Cacho Medina, Miguel Ramón                                                                                                                                                                                                                                                                                                                                                                                                                 |          |      |
| Lecturers           | Diaz-Cacho Medina, Miguel Ramón<br>Fernández Caramés, Tiago Manuel                                                                                                                                                                                                                                                                                                                                                                              |          |      |
| E-mail              | mcacho@uvigo.es                                                                                                                                                                                                                                                                                                                                                                                                                                 |          |      |
| Web                 | <a href="http://guiadocente.udc.es/guia_docent/index.php?centre=614&amp;ensenyament=614530&amp;assignatura=614530014&amp;any_academic=2022_23">http://guiadocente.udc.es/guia_docent/index.php?centre=614&amp;ensenyament=614530&amp;assignatura=614530014&amp;any_academic=2022_23</a>                                                                                                                                                         |          |      |
| General description | The Industry 4.0 paradigm derived into the proliferation of industrial devices connected to networks and physical processes. This subject, besides reviewing traditional industrial systems (i.e., industrial control systems, access controls, communication and information management systems) is focused on the security of the Industry 4.0 technologies: IoT/IIoT, robotics, cloud/edge computing, augmented reality, blockchain or AGVs. |          |      |

## Skills

Code

## Learning outcomes

|                   |             |
|-------------------|-------------|
| Learning outcomes | Competences |
|-------------------|-------------|

## Contents

| Topic                                                            |                                                                                                                                                                                                   |
|------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Introduction                                                     | Politics of industrial security<br>Implications of the *ciberseguridad industrial and of critical infrastructures<br>practical Cases                                                              |
| Systems of control of physical access to industrial dependencies | Systems of vicinity<br>Systems of remote access                                                                                                                                                   |
| Systems of industrial control                                    | Systems *biométricos<br>Architectures of communications<br>traditional Systems                                                                                                                    |
| Systems of the Industry 4.0                                      | Systems *ciberfísicos<br>Introduction to the Industry 4.0<br>Systems *IoT/*IIoT<br>*Seguridade in other technologies 4.0 (and.G., reality increased, *cloud/*edge *computing, *blockchain, *AGVs) |

|                                                                 |                                                                                                                    |
|-----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| Systems of management of information in industrial surroundings | Traditional databases<br>*ERPs<br>*PLMs<br>Systems MONTH                                                           |
| Systems of industrial communications                            | Architecture of communications<br>Technologies of communication wired up<br>Technologies of wireless communication |

| <b>Planning</b>                              |             |                             |             |
|----------------------------------------------|-------------|-----------------------------|-------------|
|                                              | Class hours | Hours outside the classroom | Total hours |
| ICT supported practices (Repeated, Dont Use) | 10          | 10                          | 20          |
| Mentored work                                | 0           | 20                          | 20          |
| Lecturing                                    | 9           | 9                           | 18          |
| Objective questions exam                     | 1           | 15                          | 16          |

\*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

| <b>Methodologies</b>                         |                                                                                                                                  |
|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
|                                              | Description                                                                                                                      |
| ICT supported practices (Repeated, Dont Use) | Realisation by part of the students of practices guided and supervised.                                                          |
| Mentored work                                | Realisation by part of the students of works of component so much theorist like practice.                                        |
| Lecturing                                    | Exhibition by part of the *profesorado of the main theoretical contents related with the *ciberseguridad in industrial outlines. |

| <b>Personalized assistance</b>               |                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Methodologies                                | Description                                                                                                                                                                                                                                                                                                                                                                                                                  |
| ICT supported practices (Repeated, Dont Use) | The professors of the subject will provide individual attention and customized to the students during it study, solving his doubts and questions. Likewise, the professors will guide and will guide to the students during the realization of the tasks that have assigned, in the practical tasks and in the guided works. The doubts generated would be attended during the lessons or even during the personalized time. |

| <b>Assessment</b>                            |                                                                                                          |               |                       |
|----------------------------------------------|----------------------------------------------------------------------------------------------------------|---------------|-----------------------|
|                                              | Description                                                                                              | Qualification | Evaluated Competences |
| ICT supported practices (Repeated, Dont Use) | Evaluation of the reports of realization of practices                                                    | 30            |                       |
| Mentored work                                | Evaluation Of the memory and execution of one guided work agreed with the student.                       | 30            |                       |
| Objective questions exam                     | Evaluation of the resulted of an examination with the contained theoretical and practical of the subject | 40            |                       |

### **Other comments on the Evaluation**

#### **FIRST OPPORTUNITY**

Two possibilities: continuous evaluation and only one evaluation.

The continuous evaluation will imply to do the laboratory practices (30%), a guided work (30%) and a mixed exam (40%). The final score has to be least 5/10. A student that delivers at least one practice will be considered that attends the continuous evaluation.

In the case of only one evaluation, the evaluation will be performed by an unique exam with theoretic and practical contents. The final score has to be at least 5/10 to pas.

The student has to choose between both alternatives before the end of the second week of lessons.

#### **SECOND OPPORTUNITY And EXTRAORDINARY ANNOUNCEMENTS**

The students that chooses the continuous evaluation have the option to hold the score of practices and guided work. The students have to pass a theoretical and practical exam. The weight of the practices, guided works and exam are the same as in the first opportunity (30,30,40).

The other students will be considered as only one evaluation and will have to realize an unique exam containing theoretical and practical parts.

#### OTHER COMMENTS

The scores of previous courses will not be hold.

Plagiarism at the work reports will be considered as a score of 0. The Master header will be informed.

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#### Sources of information

##### Basic Bibliography

Eric Knapp, Joel Thomas Langill, **Industrial Network Security.**, Elsevier, 2014

Junaid Ahmed Zubairi, **Cyber Security Standards, Practices and Industrial Applications: Systems and Methodologies.**, IGI Global, 2012

Tyson Macaulay, **Cybersecurity for Industrial Control Systems: SCADA, DCS, PLC, HMI, and SIS.**, Auerbach Publications, 2012

Josiah Dykstra, **Essential Cybersecurity Science: Build, Test, and Evaluate Secure Systems.**, O'Reilly, 2015

Pascal Ackerman, **Industrial Cybersecurity**, Packt, 2017

##### Complementary Bibliography

Peng Cheng, Heng Zhang, Jiming Chen, **Cyber Security for Industrial Control Systems: From the Viewpoint of Close-Loop.**, CRC Press, 2016

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#### Recommendations