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| **Course Name** | **Code** | **Local Credits** | **ECTS** |
| ***Discrete Mathematics*** |  |  |  |

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| **Academic Institution offering the course** | Universidad San Jorge |
| **Mode of Delivery****(in class/online/blended)** | Blended |
| **Prerequisites by topic** | None |
| **Language of Instruction** | English |
| **Level of Course Unit****(1/2/3)** |  Level 1 (Basic) |
| **Course Coordinator** | África Domingo |
| **Course Lecturer(s)** | Ana Cristina MarcénRaúl LapeñaÁfrica Domingo |
| **Course Objectives** | To address basic mathematical concepts related with discrete mathematics from which to present different applications to computing. |
| **Course Contents** | 1. Set theory. Relational database.
2. Formal Logic. Logic Circuits.
3. Modular Arithmetic. Cryptography.
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| **Learning Outcomes of the Course Unit** | 1. Work together with students from different countries in the resolution of engineering problems from a mathematical point of view.
2. Apply basic concepts and techniques from set theory to effectively communicate different developments and formal structures and to the analysis and understanding of relational databases.
3. Apply the basic concepts and techniques of propositional and predicate logic in different reasoning and proofs, as well as in the modelling and analysis of logic circuits.
4. Apply the concepts of modular arithmetic to problems related to cryptography and encryption techniques.
5. Use specific bibliography and complementary material to understand different topics.
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**DESCRIPTION**

The course is made up of three units. In each of them, basic mathematical concepts will be addressed from which to present an application to computing. The first unit covers relational databases from the perspective of set theory. A relational database is nothing more than a subset of a Cartesian product.

In the second unit, logic circuits are analysed from the perspective of first-order logic. Both are examples of a Boolean algebra. In the third unit, public and private key cryptography is discussed as modular arithmetic application examples. Each unit is based on three documents that collect respectively the theoretical content, practical exercises, and a propose ‘maths in practice’ activity in which a computing application problem is presented to be solved in groups.

**WEEKLY SUBJECTS AND RELATED PREPARATION STUDIES**

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| **Weeks** | **Subjects** |
| **1- 4** | Set theory. Relational database. |
| **5-8** | Formal Logic. Logic Circuits. |
| **9-13** | Modular Arithmetic. Cryptography. |

To follow the course the students should use the following approach:

1. Review the theorical documentation of each unit and solve the corresponding proposed exercises.

2. Use the forum to share the solutions to the proposed problems with other students. In these forums, all students can pose or answer questions. Peer collaboration is a very powerful tool for improving abilities associated to problem solving.

3. Participate in group work sessions in which the applications of discrete mathematics to computer engineering are presented.

The main goal of the online sessions is for students from different countries to work together in the resolution of engineering problems from a mathematical point of view.

Online sessions

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| **Date** | **Content** | **Link** |
| Tuesday, **October 5**, 2021**16,00-18,00** (UTC+2) | Activity 1. Relational DDBB | Join Zoom Meeting<https://us02web.zoom.us/j/6320098921>Meeting ID: 632 009 8921 |
| Tuesday, **November 9,** 2021**16,00-18,00** (UTC+1) | Activity 2. Logic circuits |
| Thursday, **December 2**, 2021**16,30-18,00** (UTC+1) | Activity 3.1 Cryptography I(Basic concepts and Private key) |
| Thursday, **December 9**, 2021**16,30-18,00** (UTC+1) | Activity 3.2 Cryptography II(Public key) |