### COURSE TITLE
**Mathematics I**

### COURSE CODE
76201

### SCIENTIFIC SECTOR
MAT/02

### DEGREE
Bachelor in Computer Science

### SEMESTER
1st

### YEAR
1st

### CREDITS
12

### MODULAR
Yes

### TOTAL LECTURING HOURS
40

### TOTAL LAB HOURS
20

### PREREQUISITES
There are no prerequisites.

### COURSE PAGE
https://ole.unibz.it/

### SPECIFIC EDUCATIONAL OBJECTIVES
- Type of course: "di base" for L-31
- Scientific area: "Formazione matematica-fisica" for L-31

**MODULE 1:**
The aim of this module is to present a rather comprehensive treatment of linear algebra and its applications. It covers vector and matrix theory to some degree of mathematical logic and rigor, emphasizing topics useful in other disciplines such as solving linear equations and computing determinants and eigenvalues of matrices. The course also provides practice in using linear algebra to think about problems in computer science, and in actually using linear algebra computations to address these problems.

**MODULE 2:**
The aim of this module is to introduce students to elementary mathematical logic and to provide a detailed introduction to basic topics in discrete mathematics. An overview of proof methods and their relation to logic will be given. The course will discuss logic as a tool for representation and reasoning in computer science. The induction principle is introduced in a number of variants, and methods to analyse and describe the main properties of relations, functions, graphs and trees will be studied. We will also introduce the basic principles governing the complex mathematical notion of cardinality of a set including different notions of infinite sets.
## MODULE 1
**Linear Algebra**

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<thead>
<tr>
<th><strong>MODULE CODE</strong></th>
<th>76201A</th>
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<tbody>
<tr>
<td><strong>MODULE SCIENTIFIC SECTOR</strong></td>
<td>MAT/02</td>
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<tr>
<td><strong>CREDITS</strong></td>
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<tr>
<td><strong>LECTURER</strong></td>
<td>Bruno Carpentieri</td>
</tr>
<tr>
<td><strong>TEACHING LANGUAGE</strong></td>
<td>English</td>
</tr>
<tr>
<td><strong>OFFICE HOURS</strong></td>
<td>Faculty of Computer Science, Piazza Domenicani 3, Office 3.10, <a href="mailto:Bruno.Carpentieri@unibz.it">Bruno.Carpentieri@unibz.it</a>, By appointment via email.</td>
</tr>
<tr>
<td><strong>TEACHING ASSISTANT</strong></td>
<td><a href="mailto:Bruno.Carpentieri@unibz.it">Bruno.Carpentieri@unibz.it</a></td>
</tr>
<tr>
<td><strong>OFFICE HOURS</strong></td>
<td>TBA, Bruno Carpentieri, Piazza Domenicani, 3, Office 1.04, <a href="mailto:Bruno.Carpentieri@unibz.it">Bruno.Carpentieri@unibz.it</a>.</td>
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</tbody>
</table>
| **LIST OF TOPICS COVERED** | • Background on complex numbers, trigonometry and polynomials  
• Vectors and matrices:  
• Linear Systems  
• Vector spaces:  
• Linear operators  
• Spectral analysis |
| **TEACHING FORMAT** | Frontal lectures, exercises in lab. |

## MODULE 2
**Logic and Discrete Mathematics**

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<tr>
<th><strong>MODULE CODE</strong></th>
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<tr>
<td><strong>MODULE SCIENTIFIC SECTOR</strong></td>
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<tr>
<td><strong>LECTURER</strong></td>
<td>Oliver Kutz</td>
</tr>
<tr>
<td><strong>SCIENTIFIC SECTOR OF THE LECTURER</strong></td>
<td>INF/01</td>
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</tbody>
</table>
### TEACHING LANGUAGE
English

### OFFICE HOURS
Office 303, Oliver.Kutz@unibz.it
By appointment via email, Piazza Domenicani, 3 - Office 303

### TEACHING ASSISTANT
Oliver Kutz, Oliver.Kutz@unibz.it
Troquard Nicolas
nicolas.troquard@unibz.it

### OFFICE HOURS
By appointment via email.

### LIST OF TOPICS COVERED
- Elements of logic and methods of mathematical proof
- Numbers and number theory
- Sets, functions and counting
- Relations and graphs
- Classical Logic (Propositional and first-order)
- Logic in computer science

### TEACHING FORMAT
Frontal lectures, exercises in lab.

### LEARNING OUTCOMES

**Knowledge and understanding**
- Have a solid knowledge of mathematics and logics that are in support of computer science;

**Applying knowledge and understanding**
- Be able to use the tools of mathematics and logics to solve problems;

**Making judgments**
- Be able to work autonomously according to the own level of knowledge and understanding;

**Ability to learn**
- Have developed learning capabilities to pursue further studies with a high degree of autonomy.

### ASSESSMENT
Written exam covering the topics of both modules.

The written exams consist of verification questions, transfer of knowledge questions and exercises. The learning outcome related to knowledge and understanding, applying knowledge and understanding and those related to the student's ability to learn and apply the acquired learning skills, will be assessed.

### ASSESSMENT LANGUAGE
English

### EVALUATION CRITERIA AND CRITERIA FOR AWARDING MARKS
Final written exam consisting of two parts, one per module, 100% covering the full program of the course. It is required to score at least 60% of the possible points for each part of the exam to pass the course. Written exam questions will be evaluated in terms of correctness, clarity, quality of argumentation, problem solving ability.
<table>
<thead>
<tr>
<th>REQUIRED READINGS</th>
<th>MODULE 1:</th>
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<tbody>
<tr>
<td></td>
<td>Gilbert Strang: Introduction to Linear Algebra, Fourth Edition</td>
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<td>Carl D. Mayer: Matrix Analysis and Applied Linear Algebra</td>
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<td><strong>MODULE 2:</strong></td>
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<table>
<thead>
<tr>
<th>SUPPLEMENTARY READINGS</th>
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<tr>
<td></td>
<td>Philip N. Klein: Coding the Matrix Linear Algebra through Applications to Computer Science, First Edition</td>
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<td><strong>MODULE 2:</strong></td>
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| SOFTWARE USED | |
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