# SYLLABUS

## COURSE DESCRIPTION

<table>
<thead>
<tr>
<th>COURSE TITLE</th>
<th>Computer Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>COURSE CODE</td>
<td>76200</td>
</tr>
<tr>
<td>SCIENTIFIC SECTOR</td>
<td>1NG-INF/05</td>
</tr>
<tr>
<td>DEGREE</td>
<td>Bachelor in Computer Science</td>
</tr>
<tr>
<td>SEMESTER</td>
<td>1st and 2nd semester</td>
</tr>
<tr>
<td>YEAR</td>
<td>1st</td>
</tr>
<tr>
<td>CREDITS</td>
<td>12</td>
</tr>
<tr>
<td>MODULAR</td>
<td>Yes</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>TOTAL LECTURING HOURS</th>
<th>40 for each module</th>
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<tbody>
<tr>
<td>TOTAL LAB HOURS</td>
<td>20 for each module</td>
</tr>
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<table>
<thead>
<tr>
<th>PREREQUISITES</th>
</tr>
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<tbody>
<tr>
<td>COURSE PAGE</td>
</tr>
<tr>
<td><a href="https://ole.unibz.it/">https://ole.unibz.it/</a></td>
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### SPECIFIC EDUCATIONAL OBJECTIVES

- Type of course: “di base” for L-31
- Scientific area: “Formazione informatica di base” for L-31

The goal of this course is to give students an understanding of:

- the architecture and organization of modern computers;
- the basic of the circuit logic involved in their construction;
- the foundation of their programming in assembly language;
- the operating systems and their components/functionality;
- the foundation of their programming in C.

## MODULE 1

### Computer Systems Architecture

<table>
<thead>
<tr>
<th>MODULE CODE</th>
<th>76200A</th>
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<tbody>
<tr>
<td>MODULE SCIENTIFIC SECTOR</td>
<td>1NG-INF/05</td>
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<tr>
<td>SEMESTER</td>
<td>1st</td>
</tr>
<tr>
<td>CREDITS</td>
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</tr>
<tr>
<td>LECTURER</td>
<td>Flavio Vella</td>
</tr>
</tbody>
</table>
### List of Topics Covered

- Computer systems organization: processors, primary memory, secondary memory, input/output.
- Boolean algebra and gates: Boolean algebra, gates, implementation of Boolean functions, circuit equivalence.
- Digital circuits: arithmetic circuits, clocks, memory, CPU chips, buses.
- Microarchitecture: design of the microarchitecture level, performance optimization.
- Instruction sets: data types, instruction formats, addressing, instruction types, flow of control.
- Assembly language programming.

### Teaching Format

This course will be delivered through a combination of formal lectures and labs.
**OFFICE HOURS**

<table>
<thead>
<tr>
<th>Thursdays, 16:00 – 18:00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office POS 2.11, Faculty of CS, POS Building, Piazza Domenicani 3</td>
</tr>
<tr>
<td><a href="mailto:Fabio.Persia@unibz.it">Fabio.Persia@unibz.it</a>, <a href="mailto:Daniela.DAuria@unibz.it">Daniela.DAuria@unibz.it</a></td>
</tr>
</tbody>
</table>

**LIST OF TOPICS COVERED**

- Programming in C
- Scheduling and concurrency
- Processes and synchronization
- File systems and memory management
- Storage management
- Security and protection

**TEACHING FORMAT**

This course will be delivered through a combination of formal lectures and labs.

**LEARNING OUTCOMES**

**Knowledge and understanding**

- understand the key principles, the structures and the organization of computer systems;
- know the fundamental principles of programming (low-level language programming and C);
- have a solid knowledge of the theoretical foundations of computer science;

**Applying knowledge and understanding**

- be able to develop programs to interact with microcontrollers and the operating system of modern computers.

**Making judgments**

- Be able to work autonomously according to the own level of knowledge and understanding
- be able to judge the use of microcontrollers and operating systems and their applicability;

**Ability to learn**

- Have developed learning capabilities to pursue further studies with some degree of autonomy;
- be able to learn the innovative features of state-of-the-art microcontrollers and operating systems.

**ASSESSMENT**

Written exam: the exam covers the topics addressed in Module 1 and Module 2 and consists of two parts:

Part one (Module 1) – Computer Systems Architecture: the assessment consists of:

- theoretical questions and exercises (some exercises can be related to what was explained during the Lab)

Part two (Module 2) – Operating Systems: the assessment consists of:

- theoretical questions and exercises (some exercises can be related to what was explained during the Lab)

The aim of the written exam (including topics covered by module 1 and module 2) is to check the understanding of fundamental concepts and whether the candidates have also acquired detailed knowledge about computer system architecture, operating systems, and their relations. This is
done through open questions about both the theoretical content and the lab exercises. The score related to each part contributes to the final grade. Specifically, to pass the exam, the students must be obtained 18/30 for each part at least.

<table>
<thead>
<tr>
<th>ASSESSMENT LANGUAGE</th>
<th>English</th>
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### EVALUATION CRITERIA AND CRITERIA FOR AWARDING MARKS

**Part one (Module 1) – Computer Systems Architecture:**
- theoretical questions (70%) and exercises related to what has been explained during the lab (30%).

**Part two (Module 2) – Operating Systems:** marks are distributed as follows:
- theoretical questions (70%) and exercises related to what has been explained during the lab (30%).

The written exam questions will be evaluated in terms of correctness and clarity.

### REQUIRED READINGS

**Module 1:**

**Module 2:**

**Module 1 and Module 2:**
- C: How to Program, Seventh Edition, Paul Deitel, Harvey Deitel
- additional material will be provided during the lessons and labs.

### SUPPLEMENTARY READINGS

**Module 1:**

**Module 2:**
- Modern operating systems, Andrew S. Tanenbaum; 2008
- Operating systems: internals and design principles, William Stallings; 2001

### SOFTWARE USED

**Module 1:**
- C/C++ or Mplab.

**Module 2:**
- C/C++