Course guide
240715 - 240715 - Programming

Unit in charge: Barcelona School of Industrial Engineering
Teaching unit: 723 - CS - Department of Computer Science.
Degree: BACHELOR’S DEGREE IN INDUSTRIAL TECHNOLOGIES AND ECONOMIC ANALYSIS (Syllabus 2018). (Compulsory subject).
Academic year: 2022  ECTS Credits: 6.0  Languages: English

LECTURER

Coordinating lecturer: Ayala Vallespí, M. Dolors
Others: Ayala Vallespí, M. Dolors
Rafieian, Bardia

TEACHING METHODOLOGY

Lecture classes: 1 hour/week, whole group. Presentation of main concepts and Python language syntax with examples.

Laboratory classes: 3 hours/week, half group. Students are asked to write and debug programs and functions under the professors' supervision.

LEARNING OBJECTIVES OF THE SUBJECT

Apply fundamental concepts of computer programming.
Develop skills in the use of basic programming techniques and tools.
Solve problems by developing small and medium scale programs.
Use abstract models in solving real problems.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Hours medium group</td>
<td>45,0</td>
<td>30.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>15,0</td>
<td>10.00</td>
</tr>
<tr>
<td>Self study</td>
<td>90,0</td>
<td>60.00</td>
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</tbody>
</table>

Total learning time: 150 h
CONTENTS

Introduction

Description:
algorithm, program, programming language
compiled and interpreted languages
Python interpreter (shell)
shell scripts
values and types (int, float, string, bool)
expressions, operands, operators
comparison operations
variables: name, type and value
assignment statement
sequential composition
input/output
program comments

Full-or-part-time: 12h
Theory classes: 1h
Practical classes: 3h
Self study : 8h

Functions

Description:
function: definition and call
formal and actual parameters, local variables
name space, scope
compound statements: indentation

Full-or-part-time: 10h 30m
Theory classes: 0h 30m
Practical classes: 2h
Self study : 8h

Branching. Conditional statement

Description:
conditional statement
branch, code block
sequential and nested conditional statements
pass statement

Full-or-part-time: 12h
Theory classes: 1h
Practical classes: 3h
Self study : 8h
### Strings

**Description:**
- string definition
- indexing ([]) 
- slicing ([:])
- membership operator (in, not in)
- string immutability
- str type and methods
- string traversal for ... in

**Full-or-part-time:** 16h 30m
- Theory classes: 2h
- Practical classes: 4h 30m
- Self study: 10h

### Lists

**Description:**
- lists and list type
- homogeneous and heterogeneous lists
- string methods that involve lists: split, join
- nested lists
- operations: len, +, *
- indexing and slicing
- list methods: count, index, append, sort, reverse
- list traversal
- mutability
- deleting elements
- aliasing and cloning
- parameters and aliasing
- modifiers (functions that change list values) and side effect

**Full-or-part-time:** 25h
- Theory classes: 3h
- Practical classes: 6h
- Self study: 16h

### Tuples

**Description:**
- tuple definition
- tuple operations
- tuple immutability

**Full-or-part-time:** 4h
- Theory classes: 0h 30m
- Practical classes: 1h 30m
- Self study: 2h
### Dictionaries

**Description:**
- Definition: pairs key:value
- Indexing (key)
- Operations: `len`, membership: `in`, `not in`
- Methods: `items`, `keys`, `values`, `get`
- Dictionary traversal
- Mutability, aliasing and cloning

**Full-or-part-time:** 18h
- Theory classes: 1h
- Practical classes: 5h
- Self study: 12h

### Files

**Description:**
- Sequential text files, line
- File opening, modes
- Methods: `read`, `readline`, `write`
- File iteration through lines

**Full-or-part-time:** 18h
- Theory classes: 1h
- Practical classes: 5h
- Self study: 12h

### Iterations with while

**Description:**
- `while` statement
- `while` versus `for`
- Infinite iterations
- Iteration counter

**Full-or-part-time:** 17h
- Theory classes: 1h
- Practical classes: 4h
- Self study: 12h
Pandas: data analysis library

Description:
Pandas is a Python library providing fast, flexible, and expressive data structures designed to make storing and querying "relational" or "labeled" data both easy and intuitive.

Specific objectives:
Database. Relational model, table-based.
Spreadsheet.
Format csv.
Pandas library.
Class Series and DataFrame of Pandas.

Full-or-part-time: 23h
Theory classes: 2h
Practical classes: 5h
Self study: 16h

GRADING SYSTEM

There are two midterm exams, E1, E2, and a final exam, FE. The total subject mark, SM, is computed as:

\[ SM = \max(E1 \times 0.2 + E2 \times 0.4 + FE \times 0.4, E1 \times 0.2 + FE \times 0.8) \]

The condition to pass is \( SM \geq 5 \)

There is a reassessment examination intended at students that have not passed \( SM < 5 \).

EXAMINATION RULES.

All exams are made with a computer in a laboratory classroom. Some of them will be taken during laboratory classes in the subgroup corresponding classroom. The other exams will be taken in lab classrooms following the student distribution that will be published in Atenea.

Students can not leave the classroom before the end of the exam.

Students must present an official ID (student card, ID, passport, driving license) and leave bags or backpacks on one side of the classroom.

Mobile phones are forbidden. They must be switched off and put into the bag or backpack. Failure to comply with this norm implies a zero-grade rating on the subject.

You can bring personal books and notes. You can also check the information stored in your account. It is forbidden to use information coming from other students or people in general.

Copies or fraudulent use of computers imply a zero-grade rating on the subject, both for the person who copies and for who has been copied.
**BIBLIOGRAPHY**

**Basic:**

**Complementary:**

**RESOURCES**

**Other resources:**
Python 3 documentation

A Quick, Painless Tutorial on the Python Language [http://heather.cs.ucdavis.edu/%7Ematloff/Python/PythonIntro](http://heather.cs.ucdavis.edu/%7Ematloff/Python/PythonIntro)

Laboratorí tools

Gnome manuals [http://library.gnome.org/users/](http://library.gnome.org/users/) (Linux desktop environment)


Linux tutorial [http://www.ee.surrey.ac.uk/Teaching/Unix/](http://www.ee.surrey.ac.uk/Teaching/Unix/) (6 first sections)

Web sites


Execute Python3 Script Online. [http://www.compileonline.com/execute_python3_online](http://www.compileonline.com/execute_python3_online). A Python 3 interpreter which does not need to install Python.