PROGRAMMING FOR DATA MANAGEMENT & ANALYSIS

BACHELOR IN DATA AND BUSINESS ANALYTICS
Professor: ROBERT DAVID POLDING
E-mail: rpolding@faculty.ie.edu

Academic year: 19-20
Degree course: SECOND
Semester: 1º
Category: COMPULSORY
Number of credits: 6.0
Language: English

PREREQUISITES
No prerequisites.
SUBJECT DESCRIPTION

Data Science is driven by code, whether it’s analysing business data or big data, coding is the way to implement algorithms of the 21st century.

Computers are one of the most configurable machines we humans have invented since the dawn of time yet most of its users are constrained to uses designed by others (third party software). In this course you will learn how to code computer programs that will allow you to expand your computer’s functionality up to its full potential.

Knowing how to code is not something reserved for computer scientists, everyone can write their own programs and if you combine your acquired mathematical and data science knowledge with the ability to write great software programs you could unleash a new set of opportunities for your career and boost your performance as an entrepreneur. If you are interested in knowing how to code software programs this course is for you.

This is a course for python beginners. The course is designed for students learning how to code the language for the first time.
OBJECTIVES AND SKILLS

The main objectives for students are the following:

- Develop logical thinking by developing programs
- Be able to solve real problems through the use of programming languages
- Get strong capabilities in programming with Python

Learning Objectives

In this course you will learn programming terminology and will obtain a solid grasp of the basic mechanics of programming. This includes:

- Introduction to problem solving for programming (i.e., "how to think about solving the problem" including techniques such as pseudo-code or flowcharts)
- Understand object oriented programming and its importance in writing business software applications
- You will be able to write fully functional console or GUI python programs
- Basics of data science tasks in Python
METHODOLOGY

The course is mainly a practical hands-on course. During the sessions we will mix theoretical lecturing with practical assignments. The course is designed for you to always have a laptop with you in class so you can code directly the exercises during the sessions. Approximately 50% of the time in the sessions we will have class discussions and theoretical lecturing together with small exercises to be completed during the session.

Additionally you will have individual coding assignments that will help you reflect on what we have learned in class.

Finally you will develop a group project in order for you to familiarize with the concept of group programming as most of the real life software projects are implemented by a group of programmers so it is good for you to be familiar with organizing work and interacting with other coders.

The last grade component will be your final exam during the last session.
<table>
<thead>
<tr>
<th>Teaching methodology</th>
<th>Weighting</th>
<th>Estimated time a student should dedicate to prepare for and participate in</th>
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<tbody>
<tr>
<td>Lectures</td>
<td>30.0 %</td>
<td>45 hours</td>
</tr>
<tr>
<td>Discussions</td>
<td>10.0 %</td>
<td>15 hours</td>
</tr>
<tr>
<td>Exercises</td>
<td>30.0 %</td>
<td>45 hours</td>
</tr>
<tr>
<td>Group work</td>
<td>20.0 %</td>
<td>30 hours</td>
</tr>
<tr>
<td>Other individual studying</td>
<td>10.0 %</td>
<td>15 hours</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100.0 %</td>
<td>150 hours</td>
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The following program is tentative. Although we will attempt to cover all the listed topics, the pace of the class depends on group performance. All group projects/presentations must be submitted via Turnitin on Campus Online. No work will be accepted if submitted otherwise.

SESSION 1
Course introduction and overview of the computer programming environment
In this session we will review the course logistics and organization together with the computer programming environment (IDEs, compilers, etc…)

SESSION 2
Data types & variables
In this session we will learn how to store information in our programs using variables and what are the different data-types for variables in Python. We will program our first “Hello World” program in the Python language.

SESSION 3
Writing Programs
In this session we will learn about types of programs, stages in programming and expressions

SESSION 4
Definite loops and the Math library
In this session we will learn about using the for loop and the math library

SESSION 5
Decision Structures (Part 1)
In this session we will learn about simple and two-way decisions and error handling

SESSION 6
Decision Structures (Part 2)
In this session we will look at different strategies with decision structures

SESSION 7
Indefinite loops
In this session we will introduce indefinite loops

SESSION 8
Boolean Algebra
In this session we will introduce boolean algebra and the underlying concepts

SESSION 9
Functions, arguments and return types
In this session we will start encapsulating our code in methods that enable us to reuse the code preventing duplication and errors in large projects

SESSION 10
Lists
In this session we will learn how to store multiple items in lists in Python

SESSION 11
Reading and Writing Files
In this session we will learn how to use files to store information on the long term memory

SESSION 12
GUI programming
In this session we will use the graphic library form Python to develop our first simple GUI based program.

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SESSION 14
Group exam

SESSION 15
Handling Data in Python
In these sessions we will learn about connecting to data sources, multidimensional lists, dictionaries and sets.

SESSION 16
Pandas
In these sessions we will learn the basics of the Pandas library as this library is the core of the data science stack in Python

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SESSION 18
Matplotlib, seaborn and plotnine
In this session we will learn how to develop data visualizations

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In this session we will learn how to develop data visualizations

SESSION 20
NumPy
In this session we will be learning scientific computing with Python using the NumPy package

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SESSION 22
SciPy
In these sessions we will cover user-friendly and efficient numerical routines such as routines for numerical integration, interpolation, optimization, linear algebra and statistics.

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SESSION 24
Practicals
In these sessions we will be setting programming challenges and practicing what we have learnt in the course.

SESSION 25
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SESSION 26
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SESSION 27
Practicals
In these sessions we will be setting programming challenges and practicing what we have learnt in the course.

SESSION 28
Practicals
In these sessions we will be setting programming challenges and practicing what we have learnt in the course.

SESSION 29
Practicals
In these sessions we will be setting programming challenges and practicing what we have learnt in the course.

SESSION 30
Final exam
BIBLIOGRAPHY
There is no mandatory reading for the course because we will review step by step the mechanics and concepts of programming in class but it would be helpful to have a Python language reference book to ease you in your programming assignments.
There are many introductory books on Python programming but we recommend:
Title: Python Programming: An introduction to computer Science
Author: John Zelle
Publisher / Edition / Year: Franklin, Beedle & Associates inc. ISBN / ISSN: 978-1-59028-241-0
EVALUATION CRITERIA

Throughout this course, you will be asked to read material related to the sessions, participate in discussions, complete individual assignments, participate in in-class quizzes, implement a group project (creating a Python program which provides a solution to a business challenge) and present the outcome of this project in class. Specifically, grading will be based on the following criteria:

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Percentage</th>
<th>Comments</th>
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</thead>
<tbody>
<tr>
<td>Class Participation</td>
<td>15 %</td>
<td></td>
</tr>
<tr>
<td>Group Assignment</td>
<td>30 %</td>
<td></td>
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<tr>
<td>Midterm</td>
<td>20 %</td>
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<tr>
<td>Final Exam</td>
<td>35 %</td>
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A. Class participation – discussion
You are expected to attend every class and participate in the discussions and class activities (games, etc.). The basic criteria in grading your participation are: a) your presence in each session, b) your (quality) contributions to the group discussion. Lively discussions in the classroom are always encouraged, however, make sure that you provide constructive comments which contribute to the learning experience of the whole class.

B. Midterm Exam
There will be a midterm test to cover basic principles. This will be group based working to solve a programming problem, and individual students will have to submit their contribution.

C. Group project implementation
A major part of this course’s learning experience consists of a group project which will be focusing on designing and implementing an algorithmic solution to a business problem. The definition of the problem as well as the main requirements will be provided to you during the sessions, so that you have only to focus on designing and implementing the best solution. Remember, creativity is always rewarded!

D. Final exam
At the end of the course you will have to pass an individual exam. This will be 30% theoretical and 70% practical.

Late Assignments/Presentation:
Will be penalized 2% per 24-hour period, starting on the day they are due. Only in cases of emergency or illness can changes be made to due dates of assignments or projects. ALL such arrangements are the full responsibility of the student and must be made PRIOR to the due date. Failure to confirm any changes to the due date with the professor prior to the due date will result in a grade of zero.

PROFESSOR BIO
Professor: ROBERT DAVID POLDING
E-mail: rpolding@faculty.ie.edu

Dr Robert Polding
Dr Polding holds a PhD and MSc in Information Systems from The University of Sheffield and a BSc (Hons) in Media Science from Sheffield Hallam University. He has taken part in research projects involving augmented reality, e-commerce, web applications, RFID and database technologies. He has lectured on database design, information systems modelling, project management, programming, operating systems, international business administration and big data.

OTHER INFORMATION

Email
If you have a question(s) that was not answered in class, you are welcome to ask your question(s) via email. I can be reached at: rpolding@faculty.ie.edu. Although I will make every effort to respond to your question(s) as quickly and thoroughly as possible, please recognize that I may not be available when you send an email. Thus, please allow me up to 48 hours to respond before sending a follow-up email.

Office Hours
If your question cannot be properly answered via email and/or you would prefer to meet in person, please make an appointment to meet with me on the university campus during my scheduled office hours. Office hours will be determined during the semester and posted on Campus Online.

As per University Policy:
Each student has 4 chances to pass any given course distributed in two consecutive academic years (regular period and July period).
It is mandatory to attend 100% of the classes. Students who do not comply with at least 70% attendance will lose their 1st and 2nd chance, and go directly to the 3rd one (they will need to enroll again in this course the next academic year).

Grading for retakes will be subject to the following rules:
1. Those students who failed the subject in the first regular period will have to do a retake in July (except those not complying with attendance rules who are banned from this possibility).
2. Dates and location of the July retakes will be posted in advance and will not be changed. Please take this into consideration when planning your summer.
3. The maximum grade that a student may obtain in the 2nd exam session is 8 out of 10. Those students in the 3rd call will be required to attend 50% of the classes. If due to schedule overlap, a different option will be discussed with the professor in order to pass the subject.

Attendance
Attendance at all scheduled classes is mandatory and essential for success in the course. If you miss class for any reason, you are responsible for getting notes from classmates. If you have questions about any assignment please send me an email. Under most circumstances, students who miss a class in which a presentation, mid-term, or final exam is held will not be granted an exception or given an opportunity to do a make-up assignment or exam. However, if illness or other circumstances prevent you from adhering to the assignment/presentation due dates stated in this syllabus, an exception may be granted at the discretion of the professor. In all cases, the student must provide official documentation (e.g., from a medical doctor, counsellor) to the professor within 24 hours of the missed due date.

Students with Special Needs
To request academic accommodations due to a special need, please contact Rafif Srour via email at: Rafif.Srour@ie.edu.

Student Privacy Statement
At times, students may disclose personal information through class discussions. It is expected that all members of the class will respect the privacy of their classmates. This means that the information disclosed in the class will not be repeated or discussed with other students outside of the course.

**ACADEMIC INTEGRITY**

Unless you are specifically instructed to work with other students in a group, all of your assignments, papers, projects, presentations, and any work I assign must reflect your own work and thinking.

What is academic integrity? When you do the right thing even though no one is watching. The core values of integrity, both academic and otherwise include: honesty, fairness, respect, responsibility, and trust. Academic Integrity requires that all students within Instituto de Empresa (IE) act in accordance with these values in the conduct of their academic work, and that they follow the rules and regulations concerning the accepted conduct, practices and procedures of academic research and writing. Academic Integrity violations are defined as Cheating, Plagiarism or other violations of academic ethics.

Cheating and plagiarism are very serious offenses governed by the IE student code of conduct. Any student found cheating or plagiarizing on any assignment or component of this course will at a minimum receive a “0” on the affected assignment. Moreover, the student will also be referred to the University Judicial System for further action. Additional penalties could include a note on your transcript, failing the class, or expulsion from the university.

It is important to note that, while the list below is comprehensive, it should not be considered exhaustive.

**Cheating includes:**

a. An act or attempt to give, receive, share, or utilize unauthorized information or unauthorized assistance at any time for assignments, papers, projects, presentations, tests or examinations. Students are permitted to mentor and/or assist other students with assignments by providing insight and/or advice. However, students must not allow other students to copy their work, nor will students be permitted to copy the work of other students. Students must acknowledge when they have received assistance from others.

b. Failure to follow rules on assignments, papers, projects, presentations, tests or examinations as provided by the course professor and/or as stipulated by IE.

c. Unauthorized co-operation or collaboration.

d. Tampering with official documents, including electronic records.

e. The impersonation of a student on presentations, exercises, tests or an examination. This includes logging onto any electronic course management tool or program (e.g. Black Board, etc.) using someone else’s login and password.

**Plagiarism includes:**

a. Using the work of others and attempting to present it as your own. For example, using phrases or passages from books, articles, newspapers, or the internet and not referencing them properly in your document. This includes using information from others without citing it, misrepresentation of cited work, and misuse of quotation marks.

b. Submitting an assignment or paper that is highly similar to what someone else has written (i.e., minimal changes in wording, or where the sentences are similar, but in a different order).

c. You don’t have to commit “word for word” copying to plagiarize – you can also plagiarize if you turn in something that is “thought for thought” the same as someone else.

**Other violations of academic ethics include:**

a. Not acknowledging that your work or any part thereof has been submitted for credit elsewhere.

b. Misleading or false statements regarding work completed.

Knowingly aiding or abetting anyone in committing any form of an Academic Integrity violation.
CODE OF CONDUCT IN CLASS

1. **Be on time**: Students arriving more than 5 minutes late will be marked as “Absent”.
   Only students that notify in advance in writing that they will be late for a specific session may be granted an exception (at the discretion of the professor).

2. **If applicable, bring your name card and strictly follow the seating chart**. It helps faculty members and fellow students learn your names.

3. **Do not leave the room during the lecture**: Students are not allowed to leave the room during lectures. If a student leaves the room during lectures, he/she will not be allowed to re-enter and, therefore, will be marked as “Absent”.
   Only students that notify that they have a special reason to leave the session early will be granted an exception (at the discretion of the professor).

4. **Do not engage in side conversation**. As a sign of respect toward the person presenting the lecture (the teacher as well as fellow students), side conversations are not allowed. If you have a question, raise your hand and ask it. If you do not want to ask it during the lecture, feel free to approach your teacher after class.
   If a student is disrupting the flow of the lecture, he/she will be asked to leave the classroom and, consequently, will be marked as “Absent”.

5. **Use your laptop for course-related purposes only**. The use of laptops during lectures must be authorized by the professor. The use of Social Media or accessing any type of content not related to the lecture is penalized. The student will be asked to leave the room and, consequently, will be marked as “Absent”.

6. **No cellular phones**: IE University implements a “Phone-free Classroom” policy and, therefore, the use of phones, tablets, etc. is forbidden inside the classroom. Failing to abide by this rule entails expulsion from the room and will be counted as one absence.

7. **Escalation policy: 1/3/5**. Items 4, 5, and 6 above entail expulsion from the classroom and the consequent marking of the student as “Absent.” IE University implements an “escalation policy”: The first time a student is asked to leave the room for disciplinary reasons (as per items 4, 5, and 6 above), the student will incur one absence, the second time it will count as three absences, and from the third time onward, any expulsion from the classroom due to disciplinary issues will entail 5 absences.