

“Structured and Object Oriented Programming with MATLAB and PYTHON”

8 Credits, (45 hours of Theory + 45 hours of Exercises & Lab)

Syllabus

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REVIEW

In objectives indicated that the course gives students basic knowledge of object-oriented programming with the use of PYTHON and MATLAB. Why two programs in the same course? Let consider some discussions about pros and cons of these programs.

Reasons to Choose MATLAB are presented in [1]:

Engineers and scientists need a programming language that expresses matrix and array mathematics directly instead of through generalized programming constructs. Matrix based MATLAB is the easiest and most productive computing environment for engineers and scientists and allows express math directly. In contrast, PYTHON is a general-purpose programming language requiring add-on libraries for performing even basic mathematics. Matrix math in PYTHON requires function calls, not natural operators, and one must keep track of the differences between scalars, 1-D arrays, and 2-D arrays.

Linear algebra in MATLAB looks like linear algebra in a textbook. The same is true for data analytics, signal and image processing, control design, and other applications. This is why more than 1,800 textbooks teach using MATLAB. PYTHON functions are typically designed and documented by advanced programmers for other experienced programmers. PYTHON development environments for scientific computing lack the reliability and integration of the MATLAB desktop.

MATLAB applications let you complete tasks more easily than with custom programming. PYTHON doesn't offer integrated workflow applications for scientific and engineering applications, requiring custom programming instead. This slows down discovery and exploration, especially for highly iterative workflows.

MATLAB is faster than PYTHON for common technical computing tasks in statistics, engineering calculations, and data visualization. PYTHON code requires overlapping and conflicting add-ons to get performance benefits such as just-in-time compilation and explicit parallel programming. These solutions tend to be incomplete or targeted at advanced programmers.

For another user PYTHON is better than MATLAB [2]:

1. PYTHON has caught up with MATLAB and is in the process of overtaking it.
2. PYTHON is a real programming language. MATLAB is not, it is a linear algebra package.

This means that if you need to add some non-numerical capabilities to your application, it gets hairy very fast.

3. PYTHON can easily interface with other languages.
4. With PYTHON, you can have a full open-source stack.
5. MATLAB licensing issues are a pain. And expensive.

In [3] discussed effectiveness of PYTHON, MATLAB, and R in a teaching environment. Researchers and scientists need powerful tool to work with the big data environment today. From such point of view PYTHON is the perfect, while MATLAB has preference in calculus and statistics. PYTHON is recognized as the best language to be taught in a classroom: it is easy to use and will allow students access to open source coding that can be found online when performing more analysis.

Object-oriented programming language is enable working with classes and objects as well as the implementation and use of the fundamental object-oriented principles and concepts: inheritance, abstraction, encapsulation and polymorphism [4]. PYTHON can meet these requirements as a multiparadigm language allowing to program in procedural, object-oriented, and functional style, or any mixture of styles [5].

If conclude from above discussions, in spite of popularity of MATLAB to compare with PYTHON, we approve using these languages to be taught. MATLAB complicated tack can be solved easier in PYTHON and vice versa. Using both MATLAB and PYTHON gives possibility to avoid lacks and reinforcing advantages of both programs.

In the syllabus properly presented following information:

- 1. Name of the course**
- 2. ECTS credits (including Theory and Exercises& Lab hours) and Prerequisites (Requirements)**
- 3. Objectives**
- 4. Learning outcomes**
- 5. Contents**
- 6. Teaching method**
- 7. Assessment method**
- 8. Textbooks, Publications, Software**

We suggest that it will be best if include following information according to “syllabus review checklist” [6].

1. Course description.

- 1.1. The length of the class should be stated (e.g., 16 weeks, 8 weeks, etc.).
- 1.2. Major topics should be included.

2. Grading policy. Should be stated:

- 2.1. A clearly quantified scale (e.g., “A”=100-90%, “A”=480500 points).
- 2.2. Final grade categories and percentages (e.g., quizzes=25% of the final grade).
- 2.3. Additional factors that may affect a student’s grade (e.g., incorrect format).
- 2.4. Late- and makeup-quiz, test, and assignment polices.

3. Attendance. It would be best if include:

- 3.1. Policy on assignments missed due to late adds, tardiness, or absence, including information about how a student can make up quizzes, tests, and assignments.
- 3.2. Late and makeup quiz, test, and assignment polices.
- 3.3. Attendance and late polices employed to drop students from the class.

The topics are provided with exercises widely and if they will be chosen as closer as possible to the specialties taught, it will help students to practice tacks related their field.

[1] MATLAB vs. Python: Top Reasons to Choose MATLAB. Internet: <https://www.mathworks.com/products/matlab/matlab-vs-python.html> [December, 04. 2018]

[2] Why Python is Better than Matlab for Scientific Software (Author: Luis Pedro Coelho, a computational biologist at EMBL). Internet: <https://metarabbit.wordpress.com/2013/10/18/why-python-is-better-than-matlab-for-scientific-software/> [December, 04. 2018]

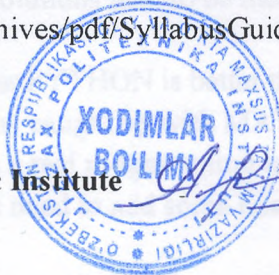
[3] Ceyhun Ozgur, Taylor Colliau, Grace Rogers, Zachariah Hughes, Elyse “Bennie” Myer-Tyson. Valparaiso University. MatLab vs. Python vs. R. Journal of Data Science 15(2017), 355-372.

[4] Chapter 20. Object-Oriented Programming Principles (OOP). Internet: <http://www.introprogramming.info/english-intro-csharp-book/read-online/chapter-20-object-oriented-programming-principles/> [December, 07. 2018]

[5] Mark Summerfield. Programming in Python 3. A complete introduction to the Python Language. Second Edition. Internet: chrome-extension://oemmndcbldboiebfnladdacbfdm/adm/https://doc.lagout.org/programmation/python/Programming%20in%20Python%203_%20A%20Complete%20Introduction%20to%20the%20Python%20Language%20%282nd%20ed.%29%20%5BSummerfield%202009-11-22%5D.pdf [December, 07. 2018]

[6] Syllabus Review. Internet: chrome-extension://oemmndcbldboiebfnladdacbfdm/adm/https://www.cuyamaca.edu/current-students/schedules/archives/pdf/SyllabusGuide.pdf [December, 07. 2018]

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