
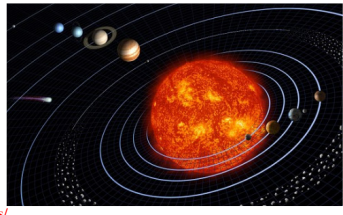


# Αντικειμενοστρεφής Προγραμματισμός (Object Oriented Programming)



## Εισαγωγή



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## Καλώς ήλθατε ...

- Καλώς ήλθατε στο μάθημα του Αντικειμενοστρεφούς Προγραμματισμού.
- Γιατί ήμαστε εδώ;
  - Επιλογή-Υποχρεωτικό
- Ποιος είναι ο Στόχος μας;
  - Έχουμε στόχο;
  - Ποιες οι αρμοδιότητες μας στην επίτευξη του;
  - Έχουμε όλοι τις ίδιες αρμοδιότητες;

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## Everybody should learn how ...

“Everybody in this country should learn how to program a computer... because it teaches you how to think.”

“We don’t need to teach our kids to code, we need to teach them **how to dream**”  
*Tom Goodwin, EVP, Head of Innovation at Zenith*

- Steve Jobs

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## Coding is Fundamental

- “**The ability to read and write** are basic to any hope of landing a decent job. But these days, **the ability to code** is so in demand by employers that some are equating it to **basic literacy**. It used to be that only a tiny subset of schoolchildren tinkered with programming languages. They became the people who built websites and created apps or filled other IT roles. But now, online classes are making a broader cohort of kids—and an ever-growing group of adults looking to gain the skills that will make them marketable in the tech sector. **Programming teaches logic, higher-level math and learning concepts that make you smarter and are useful no matter what,**” says Jake Schwartz, co-founder and CEO of General Assembly, a for-profit education startup that offers coding and design courses. “The vast majority of our students are those who, later in life, realize that this is a really interesting career and also one where there are a lot of jobs,” says Schwartz. And companies are more frequently sending employees, including executives, to short courses designed to give them at least a rudimentary understanding of what lies beneath the programs and websites they use.” Source: The Wall Street Journal, [Read more.](#)

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## If your background doesn't demonstrate ...

**Special Requirements:**  
 ... **good programming skills**, you should be prepared to work very hard to acquire them rapidly.  
 It would be best to be proficient in both a language that is suited to AI or rapid prototyping applications [Lisp, Prolog, Smalltalk] and a more conventional procedural language [Java, C, C++, C#].

MIT Media Lab

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## Bosch seeks to hire thousands of engineers



- **Software seems to be the new hardware** for automotive and electronics giant Robert Bosch GmbH.
- The German giant plans to recruit 12.000 engineers, and **software expertise ranks highest among the requirements.**
- the 129-year old giant from the German state of Baden Württemberg has grown into other technology fields, and right now it seems that the company **has discovered the thousands of synergies it can activate if it combines its traditional strengths with new technologies and application fields like Internet of Things and Industrial Internet**, Connected Car and multimodal mobility.

EETimes March 24, 2015

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## Λίγα από το παρελθόν

Item	Value	Value
CPU clock	2.39 GHz	147 MHz
memory	3 GB	272 KB
mass storage	64 GB	2.2 MB
transistors (on tubes)	4.9 billion	49,000 tubes* 23,000 transistors

1976  
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1980  
8085 Microprocessor Trainer Kit With LED Display  
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1987  
IBM Portable PC

2020

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## Η απορία σας

- Γιατί ήμαστε εδώ;
- Ποιος είναι ο στόχος μας;
- Μια ακόμη γλώσσα προγραμματισμού?

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## Μια ακόμη γλώσσα προγραμματισμού?

- C
- ... **Java ? NO!**
- Programming Paradigms
  - are a way to classify programming languages based on their features. Languages can be classified into multiple paradigms.
- Common programming paradigms
  - **imperative** in which the programmer instructs the machine how to change its state, ('first do this, next do that')
    - procedural which groups instructions into procedures,
    - object-oriented which groups instructions together with the part of the state they operate on,
  - **declarative** in which the programmer merely declares properties of the desired result, but not how to compute it

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## Programming Languages Classification

- **Procedural languages**
  - C
  - C++ (C with objects plus much else, such as, generics through STL)
  - C# (similar to Java/C++)
  - Python
- **Object-oriented class-based languages**
  - C++
  - C#
  - Java
  - Python (interpretive language, optionally object-oriented)

Source: wikipedia

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## The way programmers think

- ... researchers have long accepted that **the first programming language** has a tremendous impact on the way programmers think (Jadud 2003).

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## Python and OOP

- "So far, we have not taken advantage of the features Python provides to support object-oriented programming.
- **These features are not strictly necessary; most of them provide alternative syntax for things we have already done.**
- But in many cases, the alternative is more concise and more accurately conveys the structure of the program."

Source: ThinkPython2

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## Golang

- "one of the most likely candidates to succeed Java as the dominating enterprise software platform in the future".
  - **Go is on a trajectory to become the next enterprise programming language**
- Go's three lead developers at Google were Robert Griesemer, Rob Pike, and **Ken Thompson**
  - They set out with a goal to create a language, loosely based on the syntax of the C programming language, which would eliminate the "extraneous garbage" of languages such as C++.
  - "Though python has maintained its popularity for a long time along with conventional C++ & Java, **what is more interesting is the growth JS and GO Lang** has been showing they are catching up with incredible pace and i will not be surprised to see them at the top of the ladder in the coming future." [Source](#)

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## JavaScript

- one of the core technologies of the World Wide Web
- major web browsers have a dedicated JavaScript engine to execute it.
- has the properties of a dynamically typed **functional language**, in addition to **imperative** and **object-oriented** paradigms.
- **Node.js**
  - JavaScript run-time environment that executes JavaScript code outside of a browser

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## On Programming Languages

### Why C?

### Why Java?

The most popular programming languages for services and microservices are, in order, [Java](#), [C#](#), [C](#), [Ruby](#), [Python](#) and [C++](#). (...)

The best back-end languages will probably be Java, C#, C or C++ because these languages are highly structured and efficient in execution and resources and have extensive libraries of business tools available. Services written in C or C++ are highly efficient in resource use and high in performance, but development is costly and changes often even more so. If you have a highly volatile set of requirements, rely on contract programmers, or if you have difficulty obtaining C or C++ skills locally, you may want to think more of Java or C#.

*Source: The ServerSide*

"over 95 percent of embedded-system code today is written in C or C++" recent study by the Barr Group, 2016

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## TIOBE Index : C is back in the number one spot

### TIOBE Index for May 2020

**May Headline: Programming language C is back in the number one spot**

Java and C were already very close in April, but this month C surpasses Java again. The last time C was number one was back in 2015. We can only guess why C is number one again. One of the reasons might be the Corona virus. This might sound silly but some programming languages really benefit from this situation. Examples are Python and R in the data sciences area because everybody is searching for an antidote for the virus. But also embedded software languages such as C and C++ are gaining popularity because these are used in software for medical devices. On another note, it is also worth mentioning that Rust is really getting close to the top 20 now (from #27 to #21 within one month). - [Paul Jansen CEO TIOBE Software](#)

The TIOBE Programming Community index is an indicator of the popularity of programming languages. The index is updated once a month. The ratings are based on the number of skilled engineers world-wide, courses and third party vendors. Popular search engines such as Google, Bing, Yahoo!, Wikipedia, Amazon, YouTube and Baidu are used to calculate the ratings. It is important to note that the TIOBE index is not about the best programming language or the language in which most lines of code have been written.

The index can be used to check whether your programming skills are still up to date or to make a strategic decision about what programming language should be adopted when starting to build a new software system. The definition of the TIOBE index can be found [here](#).

May 2020	May 2019	Change	Programming Language	Ratings	Change
1	2	▲	C	17.07%	+2.82%
2	1	▼	Java	16.28%	+0.26%
3	4	▲	Python	9.12%	+1.29%
4	3	▼	C++	6.13%	-1.97%
5	6	▲	C#	4.29%	+0.30%

Source: <https://www.tiobe.com/tiobe-index/>

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## IEEE Spectrum: Top Programming Languages 2021

### Top Programming Languages 2021

This app ranks the popularity of dozens of programming languages. You can filter them by excluding sectors that aren't relevant to you, such as "Web" or "Embedded". (The sectors that languages are assigned to are based on typical use patterns we've seen in the wild, rather than atypical or proof-of-concept projects.)

Rankings are created by weighting and combining 11 metrics from eight sources: CareerBuilder, GitHub, Google, Hacker News, the IEEE, Reddit, Stack Overflow, and Twitter. (Read more about our method and sources.) Special thanks to CareerBuilder for letting us use its data.

The default set of weights produces our IEEE Spectrum ranking, but there are preset weights for those most interested in what's trending or most looked for by employers. Don't like the presets? Make your own ranking by adjusting the weights yourself using the "Create Custom Ranking" option.

Choose a Ranking: **IEEE Spectrum** Trending

Language Types: **Web** **Embedded**

Jobs:  Open  Custom  **Make**  **Unsubscribe**

(Click to hide)

Rank	Language	Type	Score
1	Python		100.0
2	Java		95.4
3	C++		94.7
4	C#		92.4
5	C#		92.4
6	R		81.7

Source: <https://spectrum.ieee.org/top-programming-languages>

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## Java - #1 job in the United States for 2021

- "I was delighted to read that the #1 job in the United States for 2021 (according to Glassdoor) is that of a Java developer, with a satisfaction rating of 4.2 (on a scale of 1 to 5). However, I'm sure that it's not the *only* great job out there. How about Java architect? Java analyst? Java code tester? Senior Java developer? Full-stack developer with an emphasis on Java? There are lots and lots of wonderful positions.

What about last year? The top job in 2020, according to the same study, was front-end developer...but the #2 spot went to Java developer. Interestingly, the job satisfaction for a Java developer in 2020 was listed as 3.9 (on the same scale). Why did the satisfaction rating improve to 4.2 for 2021? Maybe it was the release of Java 15." [Java Magazine](#)

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## Περιγραφή Μαθήματος

- Το μάθημα αναφέρεται στους μηχανισμούς χειρισμού πολυπλοκότητας στον προγραμματισμό με έμφαση στην Αντικειμενοστρεφή Τεχνολογία, που χρησιμοποιείται ευρέως στην ανάπτυξη όχι μόνο σύγχρονων πολύπλοκων συστημάτων λογισμικού αλλά και στην ανάπτυξη **Ενσωματωμένων συστημάτων, συστημάτων Μηχανοτρονικής, CPSs και IoT.**

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## Στόχος Μαθήματος

- Εξοικείωση με τους μηχανισμούς χειρισμού πολυπλοκότητας στον προγραμματισμό
  - Abstraction (Procedural and data)
  - Partitioning (+incremental development)
- Εξοικείωση με
  - το αντικειμενοστρεφές παράδειγμα προγραμματισμού και τις δυνατότητες που αυτό παρέχει για την ανάπτυξη συστημάτων
- Έμφαση δίνεται
  - στο νοητικό μοντέλο της Αντικειμενοστρεφούς Τεχνολογίας, και
  - στην χρήση της Αντικειμενοστρεφούς Τεχνολογίας στην ανάπτυξη συστημάτων γενικότερα (ενσωματωμένων συστημάτων, συστημάτων Μηχανοτρονικής και IoT)



If you don't know where you are going... how will you know when you get there?

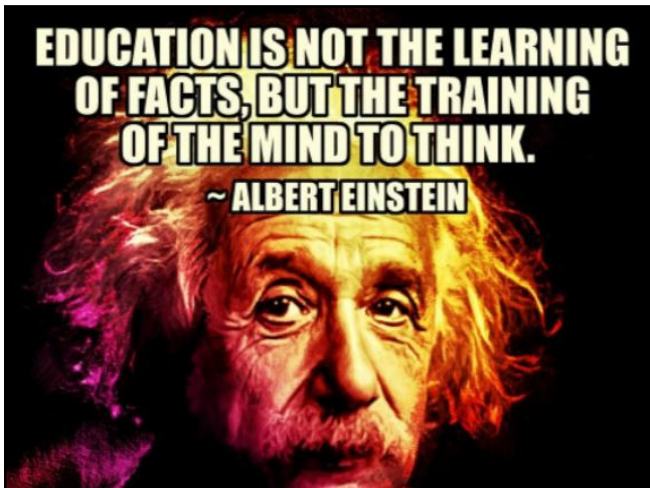
"One of the goals of higher education is to prepare students for life by enabling them to become **independent learners.**"

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## How I feel when my code works



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## Dennis Ritchie vs. Steve Jobs

Steve Jobs (b. 24 Feb 1955)

Dennis Ritchie (b. 09 Sep 1941)



They died in the same year, but it seems only few notice the death of Dennis Ritchie compared to Steve Jobs.

DIED 05 OCT 2011

DIED 12 OCT 2011

Without Steve Jobs, we would have:

- No iProducts
- No over-expensive laptops

Without Dennis Ritchie, we would have:

- No Windows
- No Unix
- No C
- No Operating Systems
- A large setback in computing
- No personal text messages
- We would all read in binary

Praised by media as Jesus of computing

Ignored

Dennis Ritchie and Ken Thompson: **1983 Turing Award** for fundamental contributions to operating systems design in general and the invention of Unix in particular.

They died in the same year, but it seems only few notice the death of Dennis Ritchie compared to Steve Jobs

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