

A background diagram on a blue field showing an IoT system. It includes a large hexagonal logo with a stylized 'E' on the left, connected by lines to a circuit board with a battery and microcontroller, a 3D cube, a smartphone, a clock, a lightbulb with gears inside, and a T-shaped sensor or actuator. The components are interconnected, representing a networked system.

# Teacher's Guide



## Code IoT Teacher's Guide

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Atribuição-NãoComercial-CompartilhaIgual  
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# Hello teacher!

We have created this guidebook to help you while administering the six **Code IoT** courses inside and outside your classroom.

Here we present an overview of the **Code IoT** courses, as guidelines on how to study and use them.

At the end of the document, you will also find ideas on how to develop lesson plans that cover everything from conceptual aspects of the Internet of Things to practical activities in programming, electronics, microcontrollers, and communication between devices.

*Cassia Fernandez, Irene Ficheman e Roseli Lopes*

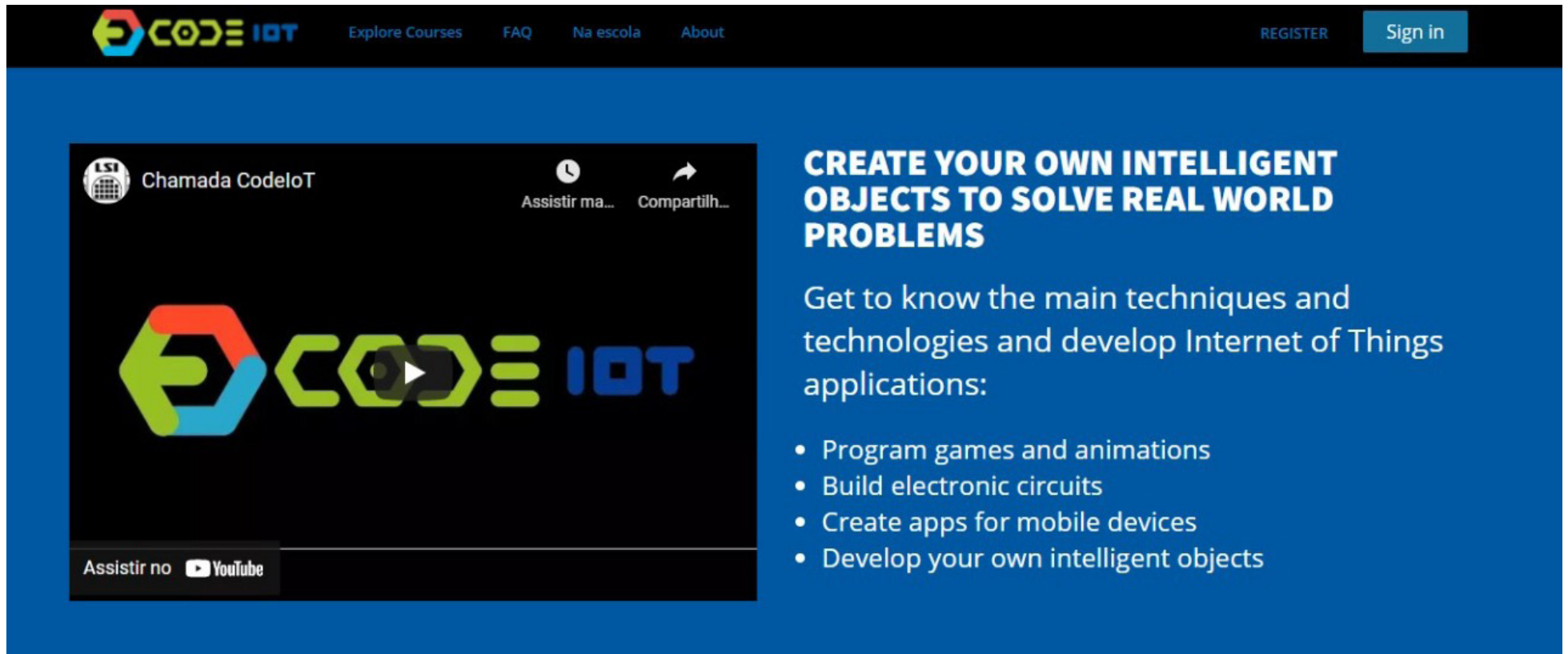
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# Code IoT Courses

The Code IoT Courses ([www.codeiot.org.br](http://www.codeiot.org.br)) were created to present introductory knowledge about technologies related to Internet of Things – or IoT. They are totally free, online and were created for Middle and High school teachers and students. However, anyone interested can enroll and start learning.



The screenshot shows the homepage of the Code IoT website. The header is black with the Code IoT logo on the left and navigation links (Explore Courses, FAQ, Na escola, About) in the center. On the right, there are buttons for REGISTER and Sign in. The main content area has a blue background. On the left, there is a video player with a play button and the text 'Chamada CodeloT'. Below the video player, there is a button that says 'Assistir no YouTube'. On the right, there is a section titled 'CREATE YOUR OWN INTELLIGENT OBJECTS TO SOLVE REAL WORLD PROBLEMS' with a list of topics: Program games and animations, Build electronic circuits, Create apps for mobile devices, and Develop your own intelligent objects.

**CREATE YOUR OWN INTELLIGENT OBJECTS TO SOLVE REAL WORLD PROBLEMS**

Get to know the main techniques and technologies and develop Internet of Things applications:

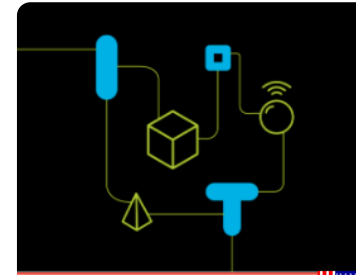
- Program games and animations
- Build electronic circuits
- Create apps for mobile devices
- Develop your own intelligent objects

Course content is made of short texts, videos and exercises, as well as a Discussion Board where the participants are encouraged to interact. The courses offered are:

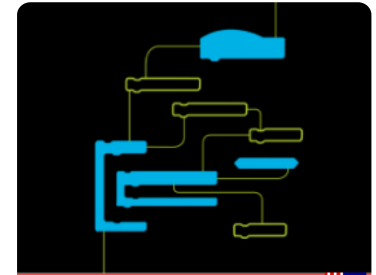
1. Introduction to the Internet of Things
2. Learning to Code
3. Electronics: concepts and basic components
4. Physical Computing
5. Apps for Mobile Devices
6. Intelligent Connected Objects

The courses cover different technologies that are useful for the development of smart devices. Throughout the courses, concepts and techniques related to Internet of Things are addressed so that participants can implement real projects using her or his acquired learnings.

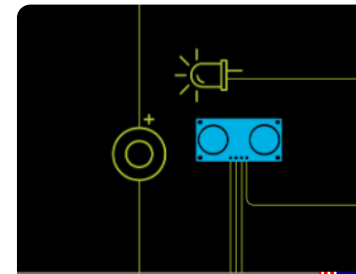
In the last course, the technologies learned along the 5 initial courses are integrated to carry out a final project. Within the course, you will also find Lesson Plans with suggestions for activities related to the content that has been studied.



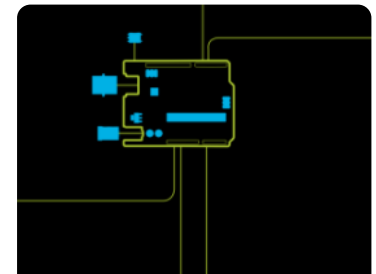
IOT101EN  
Introduction to the  
Internet of Things



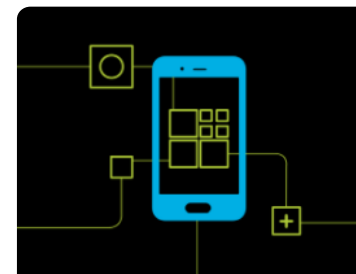
IOT102EN  
Learning to code



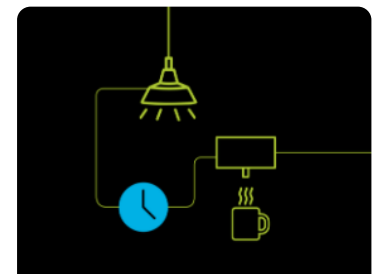
IOT103EN  
Electronics: concepts and  
basic components



IOT104EN  
Physical computing with  
Arduino



IOT105EN  
Apps for mobile devices



IOT106EN  
Intelligent connected  
objects

# Formative Itinerary

The recommended training itinerary is the order of courses listed above. However, some courses are independent of the previous ones and may be taken in a different order from the one proposed. And, depending on your prior knowledge and the prior knowledge of your students, one or the other course may not be interesting. It is not necessary to finish one course to start the next one.

Courses 1 (Introduction to the Internet of Things), 2 (Learning to Code) and 3 (Electronics: concepts and basic components) are independent and have no prerequisites in order to be completed.

For better use of course 4 (Physical Computing) it is important to have some knowledge of electronics concepts and components, or have participated in Course 3 (Electronics: Concepts and Basic components).

Course 5 (Apps for Mobile Devices) has a block programming interface that is addressed in Course 2 (Learning to Code) and uses concepts of Arduino communication addressed in course 4 (Physical Computing), as well as sensors introduced in Course 3 (Electronics: concepts and basic components).

Course 6 (Intelligent Connected Objects) is based on concepts addressed in all previous courses.

**Check out the courses prerequisites in the table below:**

Course	Prerequisites
1. Introduction to the Internet of Things	None
2. Learning to Code	None
3. Electronics: concepts and basic components	None
4. Physical Computing	Course 3
5. Apps for Mobile Devices	Courses 2, 3 and 4
6. Intelligent Connected Objects	Courses 1, 2, 3, 4 e 5



# MOOCs or Massive Courses

Courses are offered as MOOC (Massive Open On-line Course), or Massive Courses. This means the courses are free and online. Therefore, the classes usually have hundreds or even thousands of participants. During the courses, you and your students will be able to interact with classmates through the discussion board. To request help from the support team, post a message on the board starting with [SUPPORT].

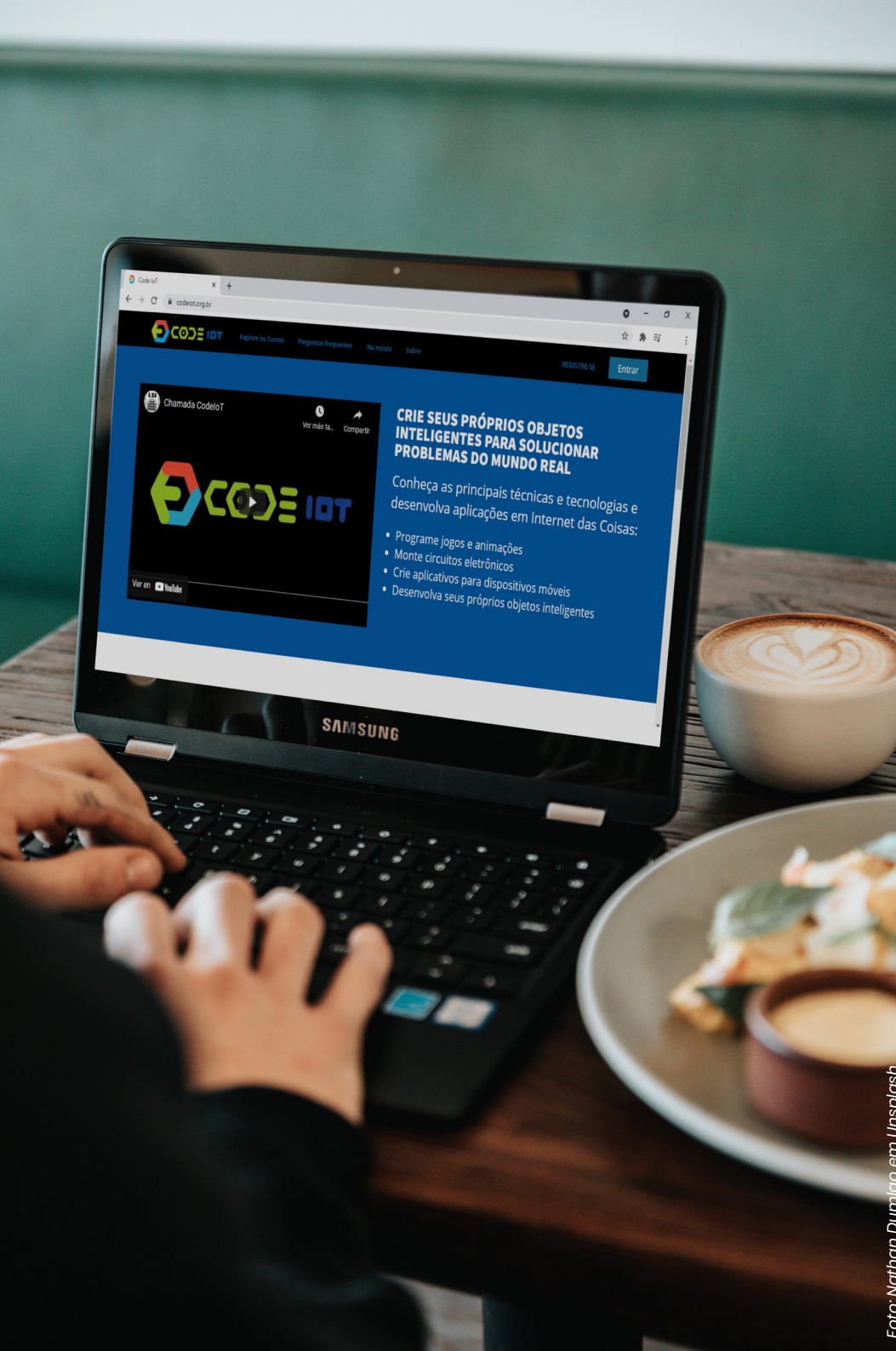


Foto: Nathan Dumlao em Unsplash



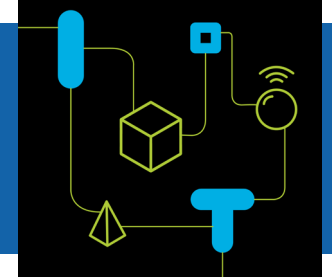
# Courses Offerings

Registration for courses is permanently open, and you can take them at your own pace.

The participant enrolled in a course will have access to the content even after its completion. Certificates are issued on the first business day of the week to all those who complete activities by the Wednesday of the week before. However, to receive it, the student will need to reach at least 60% of the final grade, which is composed of the graded assignments and the final project.

<https://codeiot.org.br/courses>

# Course 1. Introduction to the Internet of Things



In this course, your students will discover what the **Internet of Things** is and how it works, while discovering some of its applications, that are already part of their daily lives. They will also find out more about the current tendencies of the field. You will project solutions for real-world problems together and discover the technologies that allow for the development of applications in this area.

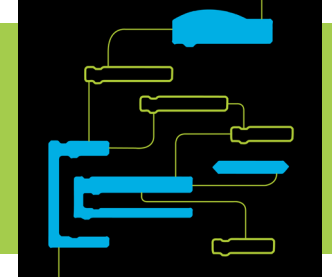
This is the only entirely theoretical course. All the other ones are practical courses, based on the development of projects.

“  
*This course made me learn a lot of different technology and IoT concepts. Thanks to this course, I learned things that I will take for the rest of my life. I loved the Code IoT course.*  
”

In this course, you will:

- Understand how the Internet works.
- Discover what the Internet of Things is and some of its applications that are already part of our daily lives.
- Learn concepts and get to know trends in Internet of Things.
- Identify problems and imagine solutions that could be developed using IoT technologies.
- Knowing tools for the development of solutions.

# Course 2. Learning to Code



This course offers an introduction to the universe of programming. Using the Scratch programming language, your students will have the opportunity to create projects involving narratives, animations, and games, while interacting in the Scratch online community and going through a hands-on learning process.

“

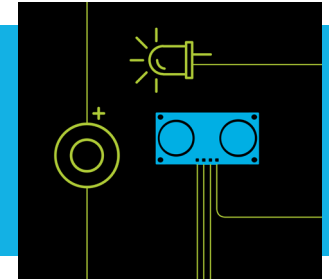
*Yes, the course allows the student to know the Scratch programming language and through this to interact with an active community. It has a very interesting proposal and also a positive one. An environment with a great diversity of ideas, creativity and a very diverse audience (age, gender, nationality, etc.) and that, in my point of view, is a true example of how to teach the importance of respecting diversity and how it is fundamental for the growth of us all.*

”

In this course, you will:

- Understand what a computer program is and develop a general view of the potentialities of programming.
- Get familiar with the Scratch environment and participate actively in the Scratch online community.
- Learn important programming concepts.
- Create your own programs.
- Use important programming practices, like remixing, debugging and sharing of projects.

# Course 3. Electronics: concepts and basic components



This course seeks to explain how an electrical circuit works and how to create circuits with electronic materials you find around you.

By becoming familiar with electronics concepts, it is possible to begin to understand how some simple electronic devices we find in our day-to-day work.

“

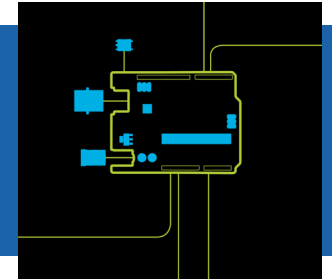
*The course as a whole is great, the written information, videos, and activities are well-prepared and concise, correlated with course texts. The course is well-structured, and I have already recommended it to other colleagues/friend professors both from the city network, from the technical schools and also my Master's program.*

”

In this course, you will:

- Learn what it is and how an electronic circuit works.
- Know the main electronic components and its applications.
- Familiarize yourself with electricity notions that will help you understand how the devices around you work.

# Course 4. Physical Computing



In this course, we learn how to use microcontrollers (Arduino or other compatibles as well), to read data from the environment and execute actions in the real world.

We also discover how some electronic devices around us work and how they can help when creating our own intelligent objects, which integrate programming and electronic circuits.

“

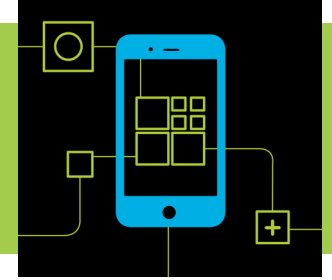
*As usual, I liked this course very much. I already suggested it to all my students, including to the computer projects monitor.*

”

In this course, you will:

- Understand what is a microcontroller and its applications.
- Identify sensors and actuators on day-to-day objects and find out how simple electronic devices around you work.
- Assemble electronic circuits and program them in order to create intelligent objects capable of reading information from the environment and acting on it.

# Course 5. Apps for Mobile Devices



This course explores, practically, concepts that are behind the functioning and creation of the smartphone apps we use.

You and your students will learn to develop programs and interfaces using AppInventor in order to make your ideas come to life.

“

*It's a wonderful project! Every time I can, I suggest the course for college friends and colleagues that are starting in the electronics and programming world. Congratulations to the developers of Code IoT!*

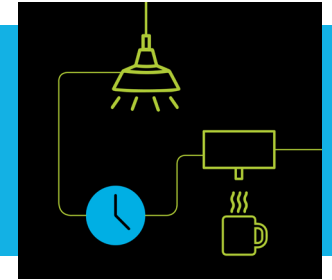
”

In this course, you will:

- Comprehend, in practice, the basic principles for app creation.
- Learn how to use the AppInventor platform to develop and interface and program apps.
- Get acquainted with design and usability concepts that are important when developing apps.
- Create your own apps and see them working in your smartphone or tablet.



# Course 6. Intelligent Connected Objects



In this course, you will use everything you learned in the previous courses in order to create solutions to real-world problems, while connecting different technologies.

You and your students will develop a final project and will learn how to create intelligent objects capable of communicating with smartphones or tablets and interacting with the environment.

“

*Thanks a lot for this opportunity. In the beginning, I thought I wasn't going to learn anything since I already work in this field, but I really enjoyed it, and it helped me solidify my knowledge while presenting me with new interesting tools.*

”

In this course, you will:

- Identify problems and develop solutions using the knowledge from the previous courses.
- Integrate electronics, programming, physical computing, and the development of apps for mobile devices.
- Make the communication between microcontrollers and mobile devices.
- Create your own Internet of Things projects with the potential to solve real-world problems.



# Materials

To keep up with courses 3, 4 and 6 some basic components are needed in order to execute the proposed projects. The materials list can be found in this address:

[codeiot.org.br/lista-de-componentes-en](https://codeiot.org.br/lista-de-componentes-en)

On this link, you will also find indications of stores that sell the components online.

Since these are practical courses, it's important that you and your students have access to the materials on the list in order to fully enjoy the lessons.



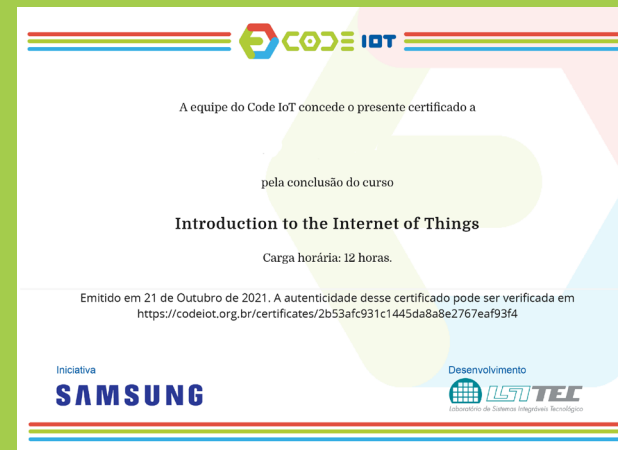
# How the Courses Work

Each course consists of 5 sections: the first four sections are composed of written and video content, as well as grade and ungraded assignments. In the last section, students dedicate themselves to the creation of a final project, that integrates all knowledge acquired during the course.

In order to receive the conclusion certificate, participants must complete all proposed activities and obtain a minimum grade of 60% (composed by the graded assignments and final project grades). Certificates are issued on the first business day of the week for all those who sent the final project until Wednesday of the previous week.



Foto: Surface em Unsplash



## Graded assignments

In each section, there is a graded assignment on the contents covered. Graded assignments do not have a deadline for completion, but they must be done because they make up the final grade, together with the final project.

## Ungraded assignments

At the end of each class, the students will be invited to interact with their peers in the Discussion Board of the course to share reflections, doubts and discuss other aspects of their projects. These are ungraded assignments - they're not graded, but they're great learning and interaction opportunities. See [page 19](#) for some tips on how interaction in the Discussion Board can be worked with your students.

## Final Project

For each course, the student must create a final project that integrates the learning acquired throughout the course. We suggest that the project is created little by little, section after section - that way when you reach the end of the course, it will be ready.

Final projects are evaluated by the Code IoT Team. So that the participant can receive a grade on your final project, it should be posted on the platform and the student too should do a self-assessment.

# Discussion Board

All people registered in the courses have access to a discussion board, in which they are ungraded assignments are posted and questions related to courses are debated.

As the courses are open to the public, it is important to align with your students basic interaction behaviors, to ensure good use of this feature. Below are some tips that can help you guide this discussion.



## Personal information

It is important not to provide personal data such as phone number or address in discussion board interactions, as well as not make appointments with other course participants they met through the forum. All care is welcome.

## Keep conversation appropriate

All messages are public and accessible to all participants. It is not recommended to use foul terms, swear words, or rude expressions with course colleagues.

## Personal criticism

We must not make personal criticisms and, in any hypothesis, offend other participants. After all, we are all apprentices and we must be respected!



# Educational resources

## CodeIoT @ School

On the website [naescola.codeiot.org.br/en](http://naescola.codeiot.org.br/en) we have gathered interesting content for you, the educator! In addition to our training schedule, you will also find practice reports of teachers who applied the learning from our online courses and in-person sessions, and created interesting dynamics with their students to deal with content related to the topics covered in the courses.

## Lesson Plans for teachers

We created and made available throughout the Code IoT courses some **lesson plans** aimed at helping teachers to address the course contents with their students inside the classroom. These lesson plans are within the contents of online courses, in separate classes, visible to all registered. In addition, you can also find them on [Code IoT @ School](#).

The ideas that are documented there can be an inspiration for you to work these themes with your students!

