Hands-On Tutorials on Electronics, in the Context of Internet of Things

Proposed by

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On behalf of

IEEE CAS Student Branch Chapter at the Universidade Federal de Juiz de Fora (IEEE CAS SB – SBC13491B)

Based on the previous experiences of the Juiz de Fora Student Branch and the CAS Student Chapter, the aim of this proposal was a series of hands-on tutorials aimed at stimulating and pre-qualifying students of Engineering and related courses for the development of IoT applications. The tutorials were programmed for three different dates during the second semester of 2017, at the at the Engineering College of Federal University of Juiz de Fora. The Electronics Laboratory (LABEL) dependencies were used for the activities.

The tutorials were conducted by more experienced Electrical Engineering students, with a close practical interaction to participants, resulting in interesting and motivating activities. The Basic Electronics Tutorial was especially sought after by the first-year undergraduate students, due to its friendly and accessible methodology.

With these tutorials, it is expected that a local IoT ecosystem can grow up, motivating the participants to start new and challenging projects. The three modules of tutorials were composed by:

- 1. A Basic Electronics tutorial;
- 2. A Microprocessors tutorial (emphasis on PIC microcontrollers);
- 3. A ESP8266 tutorial.

Each of the three modules are shortly described as follows.

1. Basic Electronics Tutorial

- Dates: August 23rd, 25th and 30th, September 1st (16 hours)
- Number of attendees: 24
- Objective: training the participants in order to start to develop projects on Analog and Digital Electronics.
- Program: Instrumentation (power supplies, multimeters, oscilloscopes, function generators), Introduction to Analog Electronics (resistors, capacitors, inductors, diodes, bipolar transistors, operational amplifiers), Introduction to Digital Electronics (logic gates, flip flops, counters), simulation and prototyping software, soldering techniques.
- Instructors: Rafael Mascarenhas Costa and Rafael da Silva Macedo.

Pictures:



2. PIC Microcontrollers Tutorial

- Dates: September 13th, 15th, 20th and 22nd (16 hours)
- Number of attendees: 16
- Objective: to give an overall knowledge of microcontroller systems; training on basic tools for programming and debugging PIC microcontrollers.
- Program: Microprocessors and Microcontrollers, RISC *versus* CISC architectures, PIC family of microcontrollers, GPIOs, Debug, EEPROM Memory, interrupts, timers, PWM modules, analog to digital converter, communications (UART, I2C, SPI).
- Instructor: Rafael Mascarenhas Costa.

Pictures:



3. ESP8266 Tutorial

- Dates: October 18th, 19th, 25th and 26th (16 hours)
- Number of attendees: 13
- Objective: to present tools for start projects related to the Internet of Things. Knowledge on the ESP8266 module and its applications.
- Program: IoT topics, basic functions and hardware, network concepts (HTTTP, IP addressing, TCP, UDP, broadcast, DNS, etc.), operation modes of the ESP8266, services on IoT (ThingSpeak, Twitter, IBM Bluemix, etc.) and Firebase development platform.
- Instructor: Luan Melo



For each of the three modules, a satisfaction survey was submitted to the attendees. The results can be seen by request to <u>estevao@engenharia.ufjf.br</u>.