Centrale Nantes

# Foundation Master

## *SIGNAL – CONTROL and ROBOTICS*

**ACADEMIC YEAR 2017 / 2018**

### *1. The teaching plan*

The Centrale Nantes Foundation Master programme is a one-year programme with a workload of 60 credit points and 360 teaching hours.

The courses are taught exclusively in English. All the courses are compulsory.

Students learn a set of essential disciplines designed to offer the range of scientific and language skills necessary to meet the complex challenges of the 12 Master's programmes of Centrale Nantes.

Each scientific course will focus on the technical and technological devices vocabulary as well as fundamental formulation. The academic programme consider 360 hours face to face with professor. The total student workload is 410 hours per year.

Each student will have a personal academic advisor as well as an administrative one for all the year.

The standard academic year in Europe is 60 ECTS credits.

### *2. The programme*

| Courses | First Semester | | | Second Semester | | |
|---|---|---|---|---|---|---|
| | Hours | Student workload (hours) | ECTS Credits | Hours - Semester 2 | Student workload (hours) | ECTS Credits |
| French language | 30 | 60 | 3 | 30 | 60 | 3 |
| English and Business Environment | 30 | 60 | 3 | 30 | 60 | 3 |
| Mathematics | 20 | 40 | 4 | 20 | 40 | 4 |
| Computer Programming and Data Analysis | 20 | 40 | 4 | 20 | 40 | 4 |
| Control Systems | 20 | 40 | 4 | 20 | 40 | 4 |
| Basics of Signal Processing and Imaging Methods | 20 | 40 | 4 | 20 | 40 | 4 |
| Robotics | 20 | 40 | 4 | 20 | 40 | 4 |
| Embedded system | - | - | - | 20 | 40 | 4 |
| Introduction to research | 20 | 40 | 4 | - | - | - |
| **Total** | **180** | **360** | **30** | **180** | **360** | **30** |

### *3. Requirements*

Applicants

- must start their last year of Bachelor degree in September 2017
- must have a high quality background in engineering fields
- is required to pass a recognized international English test such as IELTS (score 6.0 or higher) or other English equivalent test.

### *4. Tuition fees*

€6,000 for one year

€3,000 for one semester

Centrale Nantes

**Foundation Master – Program 312**

# SYLLABUS *SIGNAL – CONTROL and ROBOTICS*

**ACADEMIC YEAR 2016 /2017**

# First Semester: from September to January

# French Language (S117FRL)

## Course Information

**Code:** S117FRL

**Responsible**: Sylvia ERTL

**Contact**: sylvia.ertl@ec-nantes.fr

**Department**: Communication, languages and business

**Language**: French

**Credits (ECTS)**: 3

**Number of hours**: 30

**Semester**: 1

**Recommended prerequisites**: None

**Evaluation**:

**Organization**: French for beginners/intermediate level. The students are dispatched into different groups according to their level.

**Link**: https://centralefle.wordpress.com/

## Objective

The main objective is to familiarize the learner with the French language and French culture through an entertaining task-based communicative language teaching, focused on speaking combined with:

- Phonetics
- Self-correcting exercises on our pedagogical platform
- Learning Lab activities
- Project work
- Tutoring

Course objectives include the acquisition and reinforcement of vocabulary, syntax, and pronunciation by both traditional means and through the use of digital resources.

After completing this course, the students will be able to communicate in spoken and written French, in a simple but clear manner on familiar topics in the context of study, hobbies etc. Another important goal of this course is to introduce to French culture.

## Content

A full range of practical communication language exercises is used: reading comprehension, listening comprehension, written expression, oral expression.

Educational projects are adapted to the level of the group:

- Main project : Log book project “One year at Centrale Nantes” (Booklet)
- France vs China/Nantes vs Hometown project
- French way of life project (traditions, housing, iconic objects…)
- Photo-Babble project
- Field studies and interviews
- Flipped classroom – grammar project
- Family tree project

# English and Business Environment (S117ENL)

## Course Information

**Code:** S117ENL

**Responsible**: Christine EVAIN

**Contact**: christine.evain@ec-nantes.fr

**Department**: Communication, languages and business

**Language**: English

**Credits (ECTS)**: 3

**Number of hours**: 30

**Semester**: 1

**Recommended prerequisites**: None

**Evaluation**: 50% continuous assessment (class participation), 30% oral exam (presentation), 20% final exam (TOEIC practice exam)

**Organization**: The students are dispatched into different groups according to their level.

**Link**: pedagogical server (https://hippocampus.ec-nantes.fr; anglais LVO)

## Objective

In this course, you will learn how to:

- Develop an understanding of inter-cultural practice
- Develop oral and written communication adapted to different contexts (mainly inter-cultural situations)
- Organize, lead and participate in a meeting
- Strengthen self-confidence and level of conviction
- Work on professional documents in English
- Acquire presentation skills
- Express feelings and practice assertiveness
- Develop active listening and understanding to reformulate, explain and argue
- Develop well-being at work and a sense of responsibility
- Negotiate, innovate and propose innovative solutions
- Enhance team work

## Content

Those objectives will be achieved by doing:

- English: full range of practical communication language exercises (reading comprehension, listening comprehension, written expression, oral expression)
- Business English: introduction to marketing and business practices
- Educational projects adapted to the level of the group (scenarios, role plays, simulations).
- Analysis of a short story or an extract of a novel in order to explain the cultural components of the text.
- Projects in a cultural context "Ted talk presentation", "Edge.org assignment", etc.

# Mathematics (S117MAT)

## Course Information

**Code:** S117MAT

**Responsible**: Sébastien BOURGUIGNON

**Contact**: sebastien.bourguignon@ec-nantes.fr

**Department**: Automatic control and robotics

**Language**: English

**Credits (ECTS)**: 4

**Number of hours**: 20

**Semester**: 1

**Recommended prerequisites:** None

**Evaluation**: Final exam

**Organization**: Ten x 2h lectures, with personal homework

**Link**:

## Objective

The objective of this course is to complete students' needs both for theoretical and practical use of mathematical tools required in advanced engineering. The first semester is dedicated to linear algebra.

## Content

Vectors and matrices: basic operations. Linear systems of equations. Gauss elimination. Linear independence. Matrix rank. Solutions of linear systems: existence, uniqueness, resolution. Determinants. Matrix inversion. Inner product spaces, linear transformations. Matrix eigenvalues problems. Definitions. Determining eigenvalues and eigenvectors. Applications. Symmetric and orthogonal matrices. Eigenbases. Diagonalization. Applications. Vector differential calculus. Functions of several variables. Gradients. Divergence. Laplacian. 2D, 3D vector functions. Curves.

**Reference:**

[1] Erwin Kreyszig, *Advanced Engineering Mathematics*, 10th edition, John Wiley & Sons, 2010, 1264 p. (Chapters 7, 8)

# Computer programming and data analysis (S117CMD)

| Course Information |
| --- |
| **Code:** S117CMD |
| **Responsible**: Sébastien BOURGUIGNON |
| **Contact**: sebastien.bourguignon@ec-nantes.fr |
| **Department**: Automatic control and robotics |
| **Language**: English |
| **Credits (ECTS)**: 4 |
| **Number of hours**: 20 |
| **Semester**: 1 |
| **Recommended prerequisites:** None |
| **Evaluation**: 25% continuous assessment, 75% final exam |
| **Organization**: Ten x 2h sessions with Matlab |
| **Link**: |
| **Objective** |
| This course aims to provide students with basic knowledge of computer programming with Matlab, and to introduce more advanced tools for data analysis (visualization, statistical analysis, numerical methods). |
| **Content** |
| This course includes an introduction to the Matlab programming environment, the use of matrix variables and matrix manipulations. Scripts and functions are introduced, together with basic programming structures, conditions and loops. Graphics manipulation and statistical tools for data analysis are presented, and general programming rules and tips for efficient computations are provided. |

# Control Systems (S117CTR)

## Course Information

**Code**: S117CTR

**Responsible**: Ina TARALOVA

**Contact**: ina.taralova@ec-nantes.fr

**Department**: Automatic control and robotics

**Language**: English

**Credits (ECTS)**: 4

**Number of hours**: 20

**Semester**: 1

**Recommended prerequisites**: None

**Evaluation**: 30% continuous assessment (labs), 70% exam

**Organization**: 6 lectures (12h) + Laboratory works (3x2h) + 1 exam (2h)

**Link**:

## Objective

Control theory has a plethora of applications in various fields: from automotive and aerospace industry, robotics, production/manufacturing processes to economics and nanotechnology.

Control is applied for trajectory tracking, to improve production efficiency, to minimize the energy, to make the process faster, etc.

Control laws are generally used to regulate physical variables, to follow given trajectory, to reject perturbations/noise and to palliate with model uncertainties.

The aim of this course is to:

- Learn basics concepts and tools on linear time invariant systems (LTI), modeling, transfer functions and state space, stability, time responses. Learn to model and analyze the system using Matlab and Simulink.
- Deal with real time applications of control such as level control, temperature control, speed control, etc.

## Content

Part 1 - Modeling, time responses:

- History of control systems, dynamical system and control system (4h)
- Open loop and close loop, feedback control (4h)
- Performances and canonical form (2h)
- Application to continuous time systems (course: 2h, lab: 2x2h)
- Application to discrete time systems (course: 2h, lab: 2h)
- Exam (2h)

**Reference**:

[1] R. C. Dorf and R. H. Bishop, *Modern Control Systems*, Pearson Education, Upper Saddle River, NJ, twelfth edition, 2011, ISBN-13:978-0-13-602458-3

# Basics of Signal Processing and Imaging Methods (S117SPI)

## Course Information

**Code**: S117SPI

**Responsible**: Said MOUSSAOUI

**Contact**: said.moussaoui@ec-nantes.fr

**Department**: Automatics and Robotics

**Language**: English

**Credits (ECTS)**: 4

**Number of hours**: 20

**Semester**: 1

**Recommended prerequisites**: None

**Evaluation**: 20% continuous assessment, 30% homework, 50% exam

**Organization**: 3 lectures (6h) + Laboratory works (2x3h) + Project (6h) + 1 exam (2h)

**Link**:

## Objective

Modern sensing and measurement devices in various engineering applications yield massive numerical data in various forms. Most of these sensors give data in structured forms such as signals and images. The key feature of any signal and image processing system is to retrieve the relevant information contained in such data.

The aim of this course is to:

- Learn basics concepts and tools of signal and image processing, starting from data acquisition, communication and information retrieval.
- Address examples of data processing applications and system design in various domains: audio engineering, biomedical engineering and remote sensing.

## Content

Part 1 - Basics of signal processing:

- Fundamentals of numerical signal acquisition and representation (2h)
- Signal processing systems in audio engineering applications (course: 2h, lab: 3h)
- Applications for biomedical signal analysis (course 2h, lab: 3h)
- Study of a real case (6h)

**Reference**:

[1] Steven W. Smith, *Digital Signal Processing: A Practical Guide for Engineers and Scientists,* Newnes editor, 2002, ISBN 0-7506-7444-X

## Robotics (S117ROB)

| Course Information |
|---|
| **Code**: S117ROB |
| **Responsible**: Sophie Sakka |
| **Contact**: sophie.sakka@ec-nantes.fr |
| **Department**: Automatic control and robotics |
| **Language**: English |
| **Credits (ECTS)**: 4 |
| **Number of hours**: 20 |
| **Semester**: 1 |
| **Recommended prerequisites:** None |
| **Evaluation**: 25% continuous assessment, 25% homework, 50% exam |
| **Organization**: 9h lecture, 9h practice, 2h exam |
| **Link**: |

| Objective |
|---|
| An overview of existing robots will first be made, then the course will focus on social robotics: its objective, constraints / characteristics, current uses and hopes it brings. |
| Through practice, a social robotics program will be built, leading to a public show (exam). |
| The abilities validated at the end of the course will include capacity to lead a social robotics program: setting objectives, programming, performing, and analyzing. The practice will use NAO humanoid robots (Softbank Robotics Europe). |

| Content |
|---|
| ▪ Introduction (robots today)<br>▪ Social robotics: cost, impact and applications (therapeutic mediators, training, performance, etc.)<br>▪ Robotics performance<br>▪ Programming NAO robot (Softbank Robotics Europe) using Choregraph software<br>▪ Realizing a robotic performance with NAO robot<br>▪ Public show |

## Introduction to research (S117INR)

| Course Information |
|---|
| **Code**: S117INR |
| **Responsible**: Ina Taralova |
| **Contact**: |
| **Department**: Automatic control and robotics |
| **Language**: English |
| **Credits (ECTS)**: 4 |
| **Number of hours**: 20 |
| **Semester**: 1 |
| **Recommended prerequisites**: None |
| **Evaluation**: 30% continuous assessment, 70% project |
| **Organization**: 8 x 2h lectures, 2h practical exercises |
| **Link**: |

**Objective**

This module considers the role, purpose, structure and process of research.

It aims to answer the following questions:

- Introduction of international research organizations
- What are the motivations of research and innovation?
- Presentation of the importance of the different steps of research
- How to prepare the exhaustive bibliography and resources?
- How to prepare international publications?
- What ethical considerations are there when conducting research and publication?

How might research findings be used?

**Content**

History of science, research organization in France, research valorization, sponsoring, innovation, scientific methodology, bibliographic study, paraphrasing of articles' extract, intellectual property, plagiarism awareness, research ethics, writing a scientific article, preparing a presentation.

# First Semester: from February to June

# French Language (S217FRL)

## Course Information

**Code**: S217FRL

**Responsible**: Sylvia ERTL

**Contact**: sylvia.ertl@ec-nantes.fr

**Department**: Communication, languages and business

**Language**: French

**Credits (ECTS)**: 3

**Number of hours**: 30

**Semester**: 2

**Recommended prerequisites**: None

**Evaluation**: 25%  continuous assessment, 25% oral exam, 25% final exam, 25% project work (booklet)

**Organization**: French for beginners/intermediate level. The students are dispatched into different groups according to their level.

**Link**: https://centralefle.wordpress.com/

## General course objective

The main objective is to familiarize the learner with the French language and French culture through an entertaining task-based communicative language teaching, focused on speaking combined with:

- Phonetics
- Self-correcting exercises on our pedagogical platform
- Learning Lab activities
- Project work
- Tutoring

Course objectives include the acquisition and reinforcement of vocabulary, syntax, and pronunciation by both traditional means and through the use of digital resources.

After completing this course, the students will be able to communicate in spoken and written French, in a simple but clear manner on familiar topics in the context of study, hobbies etc. Another important goal of this course is to introduce to French culture.

At the end of course (60 hours), the complete beginners can achieve the level A1 and some aspects of A2 of The Common European Framework of Reference for Languages. More advanced students may aim the levels B1/B2.

## Content

A full range of practical communication language exercises is used: reading comprehension, listening comprehension, written expression, oral expression.

Educational projects adapted to the level of the group:

- Main project : Log book project “One year at Centrale Nantes” (Booklet)
- French way of life project (traditions, housing, iconic objects…)
- Expressing emotions and theatre project
- Photo-Babble project
- Field studies and interviews
- Flipped classroom – grammar project

# English and business Environment (2116ENL)

## Course Information

**Code**: S217ENL

**Responsible**: Christine EVAIN

**Contact**: christine.evain@ec-nantes.fr

**Department**: Communication, languages and business

**Language**: English

**Credits (ECTS)**: 3

**Number of hours**: 30

**Semester**: 2

**Recommended prerequisites**: None

**Evaluation**: 50% continuous assessment (class participation), 30% oral exam (presentation), 20% final exam (TOEIC practice exam)

**Organization**: The students are dispatched into different groups according to their level.

**Link**: pedagogical server (https://hippocampus.ec-nantes.fr; anglais LVO)

## Objective

In this course, you will learn how to:

- Understand the general concepts of business English and marketing principles
- Build their professional project and explore international opportunities
- Develop strategies for inter-cultural practice
- Develop oral and written communication adapted to different contexts
- Organize, lead and participate in a meeting
- Work on professional documents in English
- Acquire a professional lexicon
- Understand the principles of corporate business models
- Acquire notions of corporate culture and values
- Develop well-being at work and a sense of responsibility
- Negotiate, innovate and propose innovative solutions

## Content

Those objectives will be achieved by doing:

- English: full range of practical communication language exercises
- Business English: exercises to explore in practice the areas of management and marketing

Educational projects adapted to the level of the group (scenarios, role plays, simulations).

Analysis of a short story or an extract of a novel in order to explain the cultural components of the text.

Projects in a professional context "Start-up simulation", "marketing assignment", "advertising assignment", etc.

# Mathematics (S217MAT)

## Course Information

**Code**: S217MAT

**Responsible**: Sébastien BOURGUIGNON

**Contact**: sebastien.bourguignon@ec-nantes.fr

**Department**: Automatic control and robotics

**Language**: English

**Credits (ECTS)**: 4

**Number of hours**: 20

**Semester**: 2

**Recommended prerequisites:** Calculus fundamentals.

**Evaluation**: Final exam

**Organization**: Ten x 2h lectures, with personal homework

**Link**:

## Objective

The objective of this course is to complete students' needs both for theoretical and practical use of mathematical tools required in advanced engineering. The second semester is dedicated to ordinary differential equations, probability and statistics.

## Content

Part 1 - Ordinary differential equations:

- *First-order ordinary differential equations.* Implicit form, explicit form. Direction fields. Separable ODEs. Exact ODEs. Linear ODEs. Applications and modelling.
- *Linear ordinary differential equations.* Homogeneous second-order linear ODEs. Homogeneous second-order linear ODEs with constant coefficients. Non-homogeneous ODEs. Laplace transforms. Fourier transforms. Systems of linear ODEs.

Part 2 - Probability and statistics:

- Data analysis: mean, variance, standard deviation
- Probabilities of events, combinations
- Random variables, probability distributions (discrete and continuous)
- Gaussian distributions

**Reference**:

[1] Erwin Kreyszig, *Advanced Engineering Mathematics*, 10th edition, John Wiley & Sons, 2010, 1264 p. (Chapters 1, 2, 6, 24)

## Computer programming and data analysis (S217CMD)

| Course Information |
|---|
| **Code**: S217CMD |
| **Responsible**: Sébastien BOURGUIGNON |
| **Contact**: sebastien.bourguignon@ec-nantes.fr |
| **Department**: Automatic control and robotics |
| **Language**: English |
| **Credits (ECTS)**: 4 |
| **Number of hours**: 20 |
| **Semester**: 2 |
| **Recommended prerequisites: :** None |
| **Evaluation**: 25% continuous assessment, 75% final exam |
| **Organization**: Ten x 2h sessions with Matlab |
| **Link**: |
| **Objective** |
| Data processing courses provide students with knowledge and skills related to the processing, administration and management of computer system databases. Read on for an overview of the most common data processing courses. |
| **Content** |
| This course offers students an overview of computer information systems, hardware, software and procedures. Students may use this course as prerequisite coursework for advanced data processing coursework during the Centrale Nantes Masters of engineering programs. |

# Control Systems (S217CTR)

## Course Information

**Code**: S217CTR

**Responsible**: Ina TARALOVA

**Contact**: ina.taralova@ec-nantes.fr

**Department**: Automatic control and robotics

**Language**: English

**Credits (ECTS)**: 4

**Number of hours**: 20

**Semester**: 2

**Recommended prerequisites:** None

**Evaluation**: 30% continuous assessment (labs), 70% exam

**Organization**: 6 lectures (12h) + Laboratory works (3x2h) + 1 exam (2h)

**Link**:

## Objective

Control theory has a plethora of applications in various fields: from automotive and aerospace industry, robotics, production/manufacturing processes to economics and nanotechnology.

Control is applied for trajectory tracking, to improve production efficiency, to minimize the energy, to make the process faster, etc.

Control laws are generally used to regulate physical variables, to follow given trajectory, to reject perturbations/noise and to palliate with model uncertainties.

The aim of this course is to:

- Learn basics concepts and tools on linear time invariant systems (LTI), modeling, transfer functions and state space, stability, time responses. Learn to model and analyze the system using Matlab and Simulink.
- Deal with real time applications of control such as level control, temperature control, speed control, etc.

## Content

Part 2 - Frequency responses, controllers design in the frequency domain:

- Introduction to frequency responses, first and second order systems (2x2H)
- Design of controllers (P,PI,PID, lead and lag controllers) in the frequency domain (2x2H)
- Performance analysis, stability and robustness (2H)

Part 3 - Applications:

- Controller design labs (temperature control, level control, speed control, …) (2x4h)

**Reference**:

[1] R. C. Dorf and R. H. Bishop, *Modern Control Systems*, Pearson Education, Upper Saddle River, NJ, twelfth edition, 2011, ISBN-13:978-0-13-602458-3

## Basics of Signal Processing and Imaging Methods (S217SPI)

### Course Information

**Code**: S217SPI

**Responsible**: Said MOUSSAOUI

**Contact**: said.moussaoui@ec-nantes.fr

**Department**: Automatics and Robotics

**Language**: English

**Credits (ECTS)**: 4

**Number of hours**: 20

**Semester**: 2

**Recommended prerequisites**: None

**Evaluation**: 20% continuous assessment, 30% homework, 50% exam

**Organization**: 3 lectures (6h) + Laboratory works (2x3h) + Project (6h) + 1 exam (2h)

**Link**:

### Objective

Modern sensing and measurement devices in various engineering applications yield massive numerical data in various forms. Most of these sensors give data in structured forms such as signals and images. The key feature of any signal and image processing system is to retrieve the relevant information contained in such data.

The aim of this course is to:

- Learn basics concepts and tools of signal and image processing, starting from data acquisition, communication and information retrieval.
- Address examples of data processing applications and system design in various domains: audio engineering, biomedical engineering and remote sensing.

### Content

Part 2 - Imaging systems:

- Fundamentals of imaging systems and image analysis (course: 2h)
- Multimodal imaging and applications (course 2h, lab: 4h)

Part 3 - Applications:

- Projects of signal and image processing systems design (10h)

**Reference**:

[1] Steven W. Smith, *Digital Signal Processing: A Practical Guide for Engineers and Scientists,* Newnes editor, 2002, ISBN 0-7506-7444-X

# Robotics (S217ROB)

## Course Information

**Code**: S217ROB

**Responsible**: Damien Chablat

**Contact**: damien.chablat@ec-nantes.fr

**Department**: Automatic control and robotics

**Language**: English

**Credits (ECTS)**: 4

**Number of hours**: 20

**Semester**: 2

**Recommended prerequisites:** None

**Evaluation**: 25% continuous assessment, 25% homework, 50% exam

**Organization**: 6h lecture, 12h practice , 2h exam

**Link**:

## Objective

The objective of this course is to discover industrial robots. In a first step, I will present the different robot's architectures and their main characteristics. Then we will do kinematic modeling to discover the properties of robots, workspace and singularities. After that, we will discuss the generation of trajectories in the articular and Cartesian space. I will introduce the different types of trajectory of the robots and the link with the industrial processes. The concept of optimal placement will be discussed as well as the simple methods that can be used in robotic CAD software. With this course, students will have tools to choose a robot for an industrial application.

The different stages of the course will be illustrated using the DELMIA software to create:

- a robot
- a tool
- a robotic cell with pick and place operations
- a robotic cell with welding operations

## Content

Material Science:

- Introduction of industrial robots
- Modeling of robots
- Workspace and singularities
- Trajectory planning

**References**:

[1] W Khalil and E Dombre, *Robot: Modeling, Identification and Control*, Butterworth-Heinemann 2004

[2] E. Dombre, P. Chedmail, P. Wenger, *La CAO en robotique*, Hermès Science Publications, 1998

[3] J. Angeles, *Fundamentals of Robotic Mechanical Systems*, Springer, 2014

# Embedded System (S217EMS)

## Course Information

**Code**: S217EMS

**Responsible**: Pierre Molinaro

**Contact**: pierre.molinaro@irccyn.ec-nantes.fr

**Department**: Automatic control and robotics

**Language**: English

**Credits (ECTS)**: 4

**Number of hours**: 20

**Semester**: 2

**Recommended prerequisites**: Knowledge of programming, C language, and electronics is desired.

**Evaluation**: 50% continuous assessment (labs), 50% exam

**Organization**: 2h lecture, 16h laboratory works, 2h exam

**Link**:

## Objective

The objective of the course is to present the base of programming embedded systems. At the end of this course, the students will be able to write programs carrying out simple automatisms.

## Content

Teaching is carried out mainly by courses / workshops, where students write the code of the program to be carried out. The support of the practical work is the Teensy 3.1 card, which is handled by the Arduino environment.

Main chapters:

- Introduction to embedded computing
- Arduino software
- C language basis
- Description of microcontrollers
- Digital Output
- Digital Input
- Analog input
- PWM output
- Real-Time Interrupts
- Volatile Variables

**References:**

Richard Blum, *Arduino Programming in 24 Hours, Sams Teach Yourself*, Sams Editor, August 2014, .ISBN-13: 978-0672337123

Mark Geddes, *Arduino Project Handbook, 25 pratical projects*, No Start Press Editor, ISBN-13: 978-1593276904