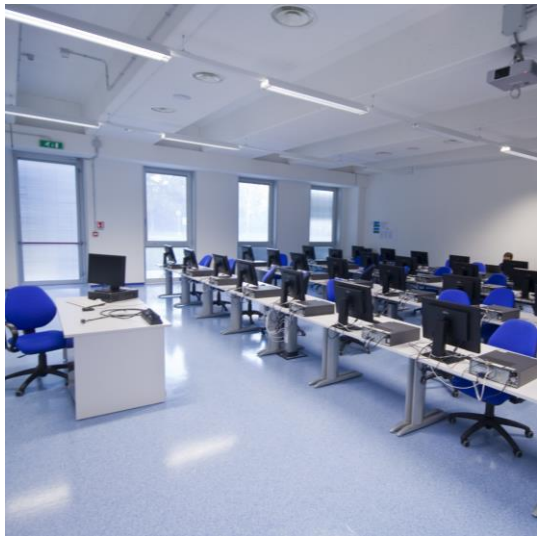
University of Udine (Italy)

Pierpaolo Palestri

Polytechnic department of Engineering and Architecture



https://www.uniud.it/en/uniud-international?set_language=en

Where

Downtown Udine

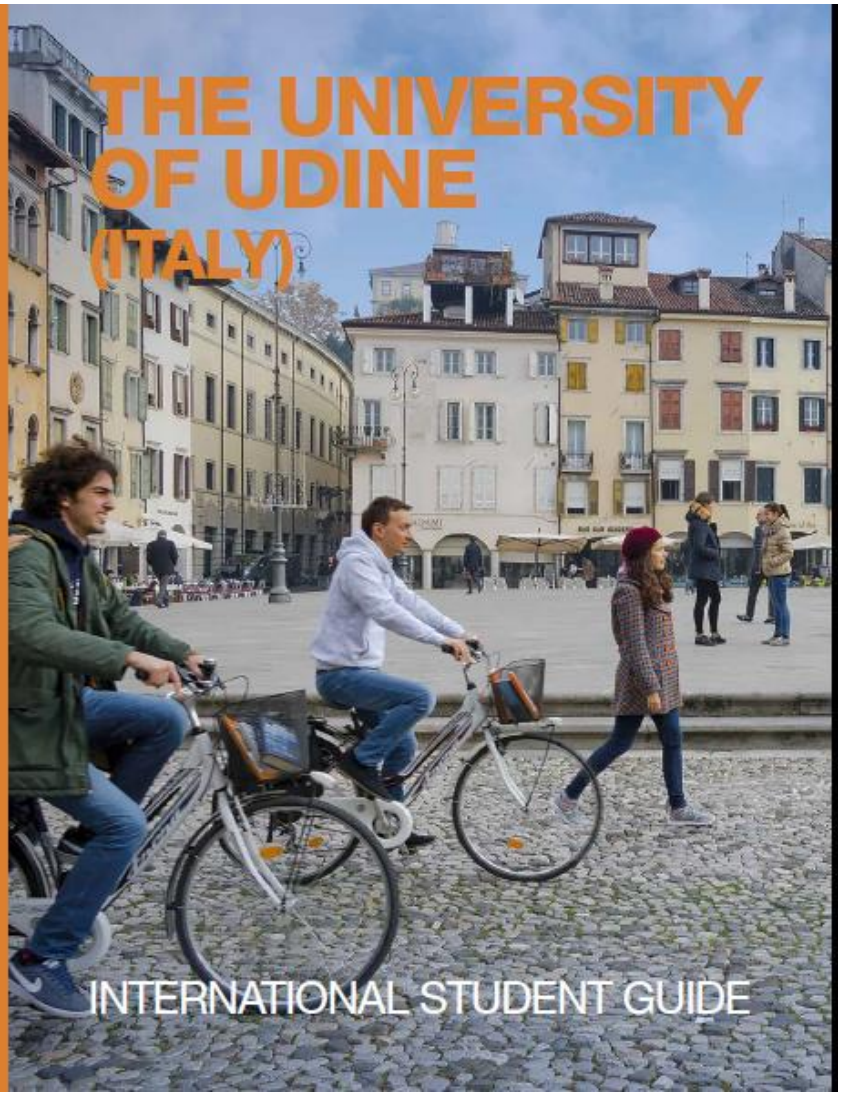
Palmanova

Alps

Vineyards

Aquileia

UNIVERSITÀ
DEGLI STUDI
DI UDINE
hic sunt futura



https://www.uniud.it/it/international-area/relazioni-internazionali/why-study-in-udine1/Brochure_UNIUD.pdf/

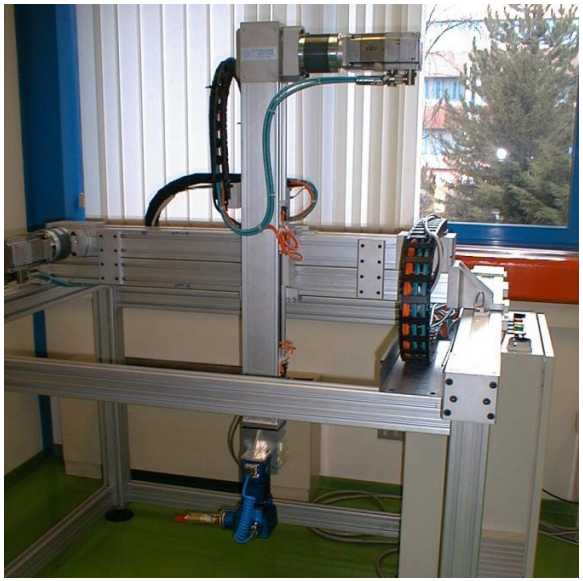
Bachelor courses @DPIA

- Architectural Sciences
- Building and territory technology
- Civil and environmental engineering
- Cleaner production engineering
- Electronic engineering
- Management Engineering
- Mechanical Engineering

Master courses @DPIA

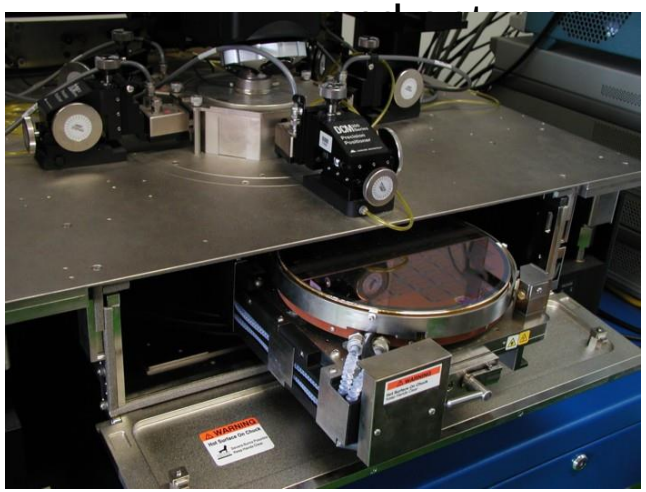
- Civil Engineering
- Environmental and Territorial Engineering
- Energy and Environment
- Electronic engineering
- Management Engineering
- Mechanical Engineering
- Architecture

Labs: Electronic Engineering



Power electronics, drivers and robotics

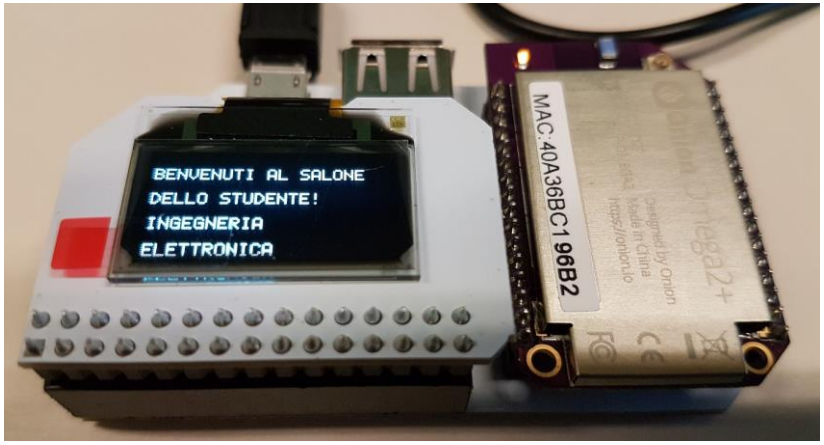
Wireless communications



Nano-electronics devices

Labs: Electronic Engineering

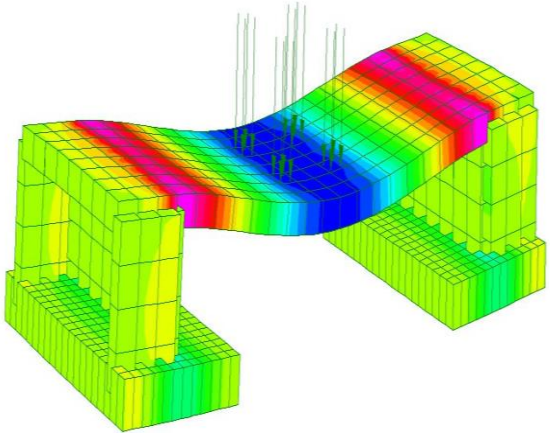
IoT and distributed systems lab



Video production

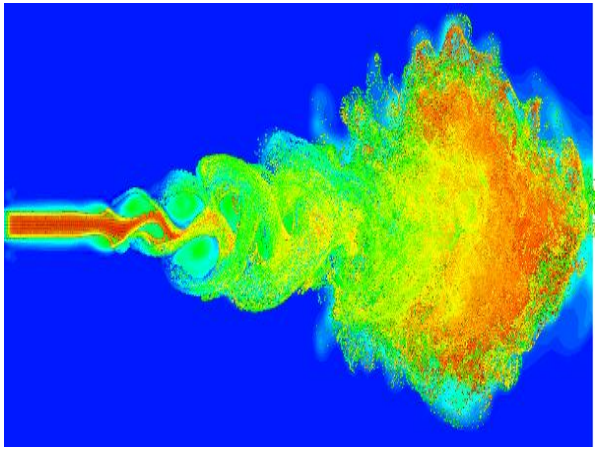
Labs: Mechanical engineering.

Vibrations'analysis

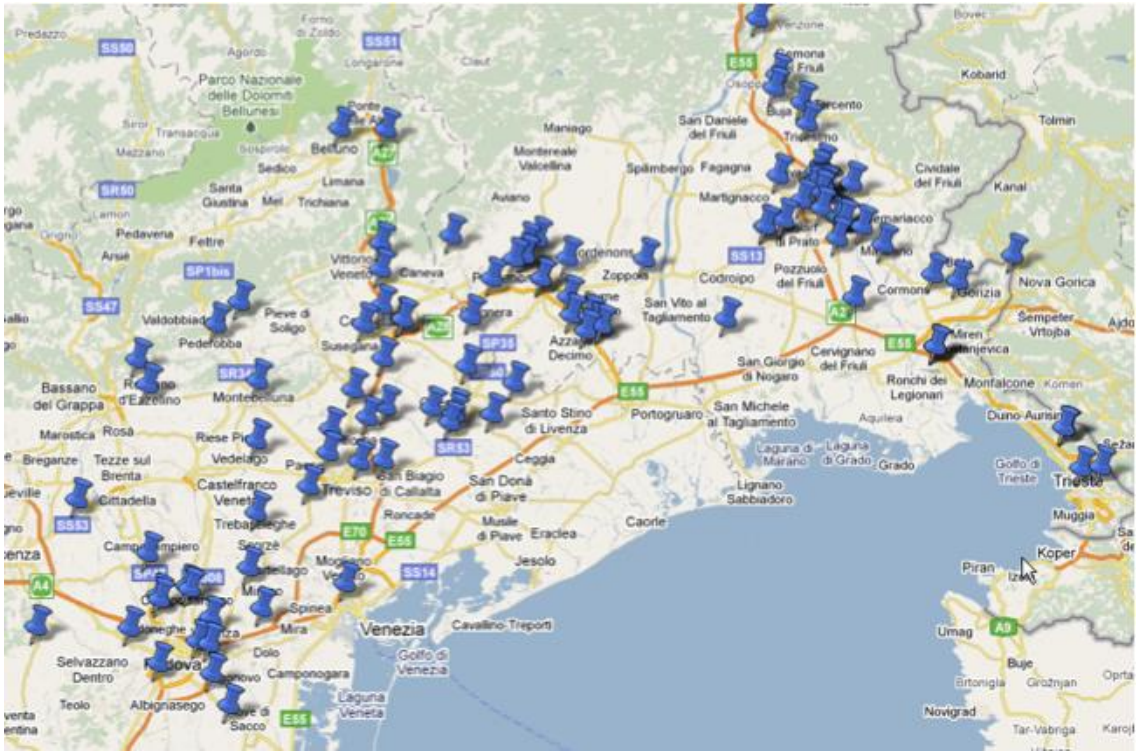


Metallographic analysis

Fluid dynamics



Network with companies: Electronic Engineering



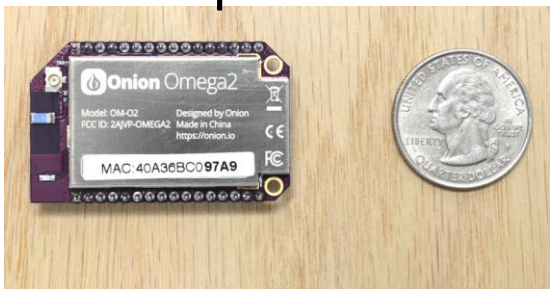
Network with companies: management engineering

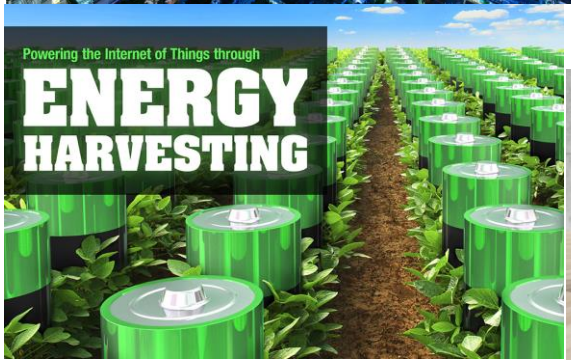
Electronic Engineering

Smart cities

Solar plants

processors

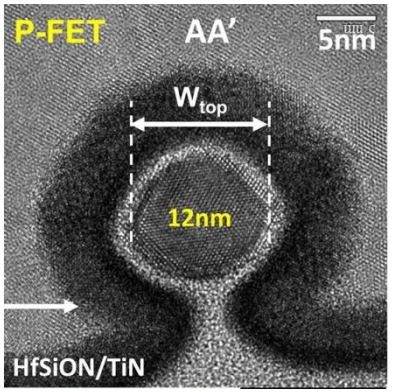


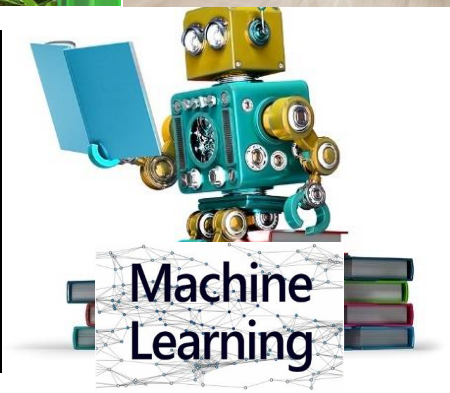


Electric mobility

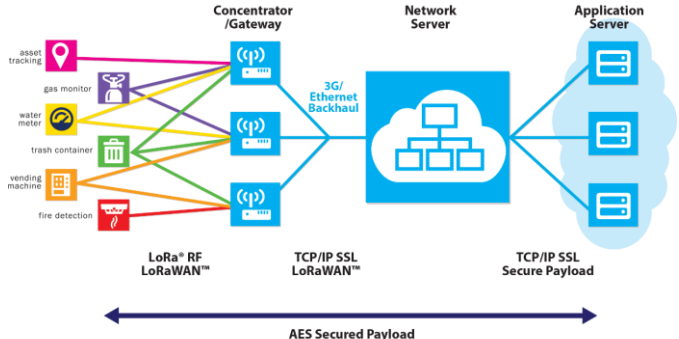
robotics

nanoelectronic





networks



Electronic Engineering

Bachelor

CURRICULUM **Electronic systems and Information technologies**

CURRICULUM **IT and networks**

CURRICULUM **Mechatronics and robotics**

curriculum selected at the end of 2° year

Master

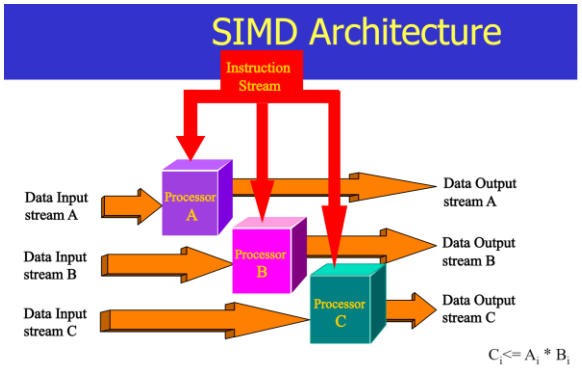
The three above plus:
"IoT and Industry4.0" and **«Technologies for Artificial Intelligence"**

Courses in English @ EE

- A selection of courses at the Master level are taught in English
- Most of them are suitable also for Bachelor students

PARALLEL ARCHITECTURES

- The onset of higher abstraction forms of parallelism:
  - Flynn classification
  - MIMD architectures
    - multicore/multiprocessor architectures
    - cache coherence protocols
    - Shared Memory and Message Passing organizations
  - SIMD architectures
    - GPU architectures
    - GPGPU and Accelerated applications:
      - CUDA and CUDA Lab
      - OpenCL and OpenCL Lab



ICT LABORATORY

- How it works:
  - The student is asked to develop a project assigned by the teacher
  - The project is described at “user level:" what it should do, but not how does it
  - The students can choose any reasonable solution
  - Students work typically in group
  - When ready they present the result of their work to the teacher
  - The final report is a web site that will be put on-line. See:

http://www.diegm.uniud.it/rinaldo/ele/Sito/Studiare_Ingegneria_Elettronica.html

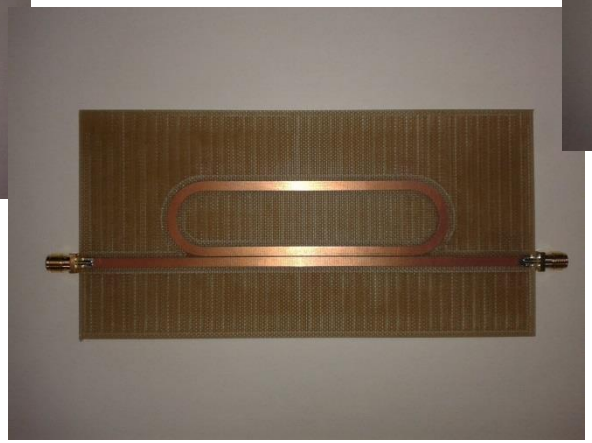
or

http://www.diegm.uniud.it/bernardini/Laboratorio_Didattico/

- Objectives:
  - To let the students work autonomously
- Acquired skills
  - Ability of working autonomously

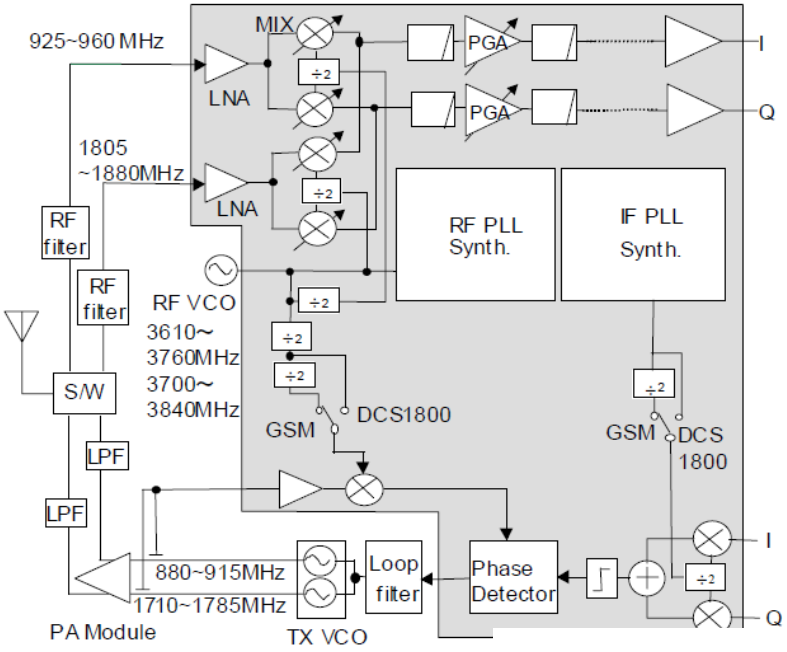
MICROWAVES

- The course aims at suppling the methodology for the study and the design of microwave circuits and devices.

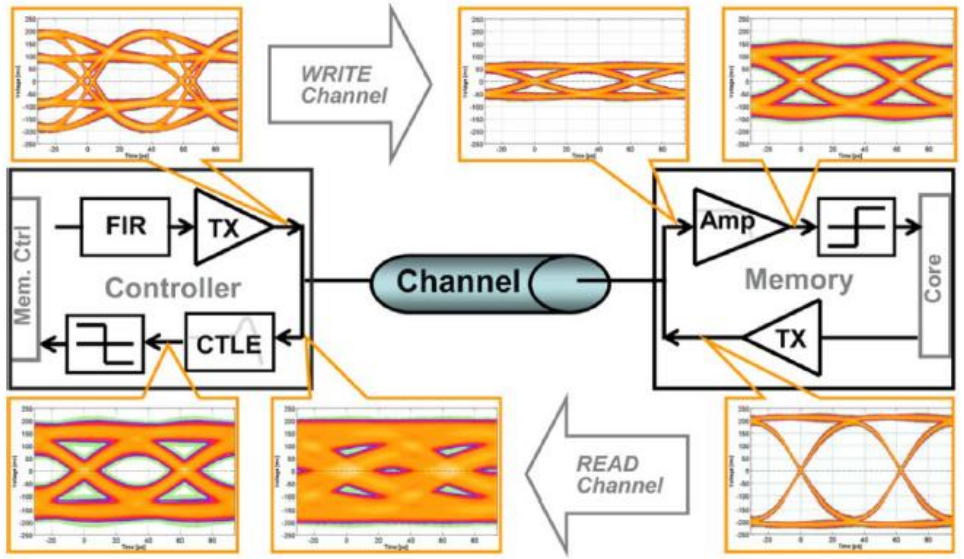


ELECTRONIC SYSTEMS FOR HIGH FREQUENCIES (1ST SEM.)

ARCHITECTURE OF RF TRANSCEIVERS

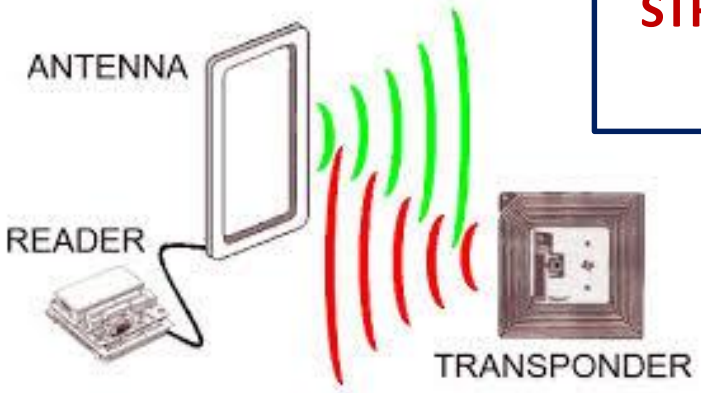


HIGH-SPEED SERIAL INTERFACES



STRONG LINK WITH INFINEON VILLACH

RFID/NFC SYSTEMS

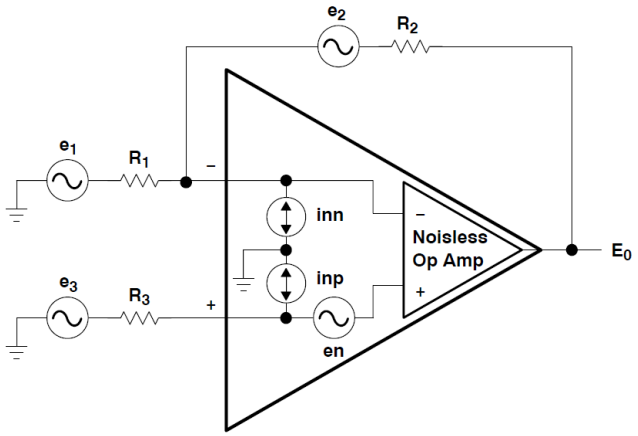


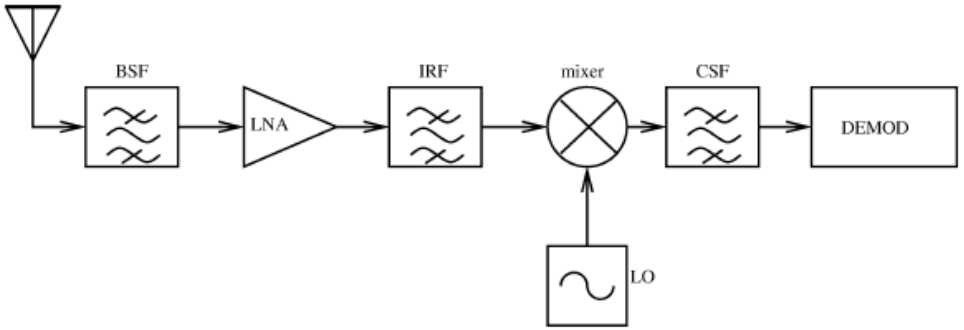
ELECTRONIC SYSTEMS FOR HIGH FREQUENCIES

MAIN ACQUIRED SKILLS/COMPETENCIES

- system level design and analysis of RF transceivers, high-speed serial interfaces and RFID NFC systems

- computing the noise in simple electronic circuits;





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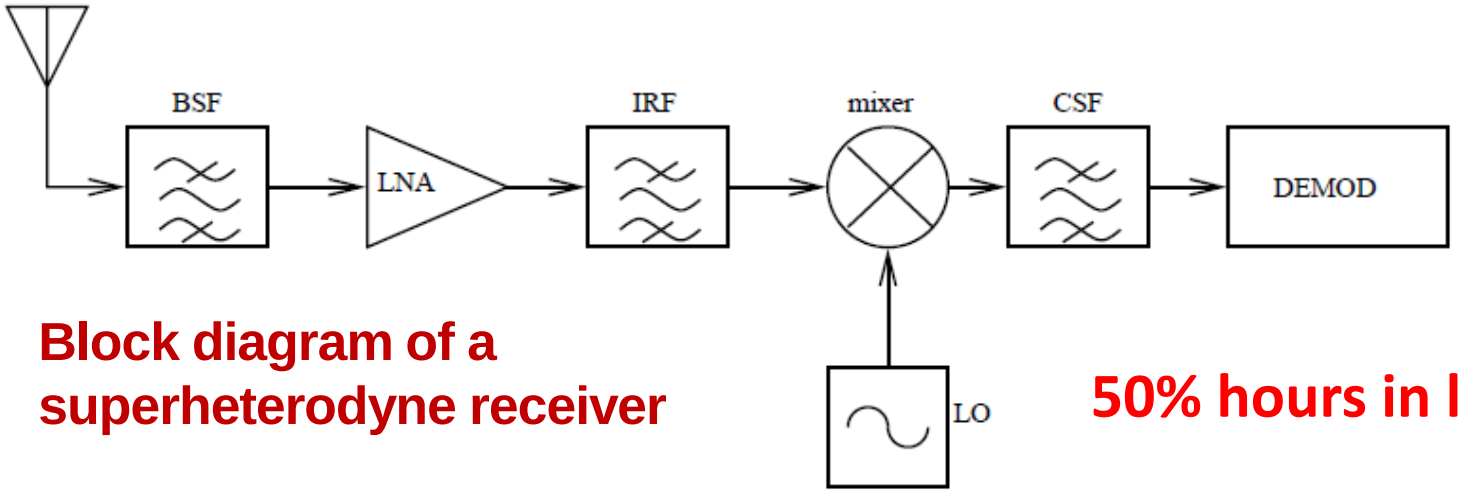
- computing the figures of merit of RF systems starting from the parameters of the single blocks;

ELECTRONIC CIRCUITS FOR HIGH FREQUENCIES (1ST SEM.)



Block diagram of a superheterodyne receiver

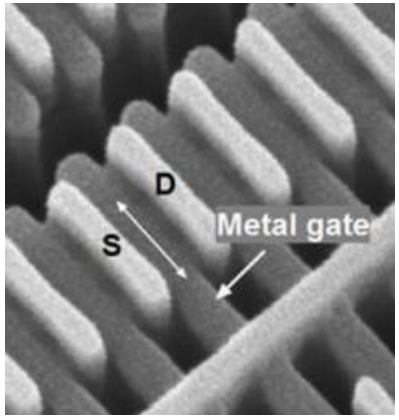
50% hours in lab

The course explains the working principle at circuit level of the building blocks used in most VLSI transmitter-receivers, including:

- ❑ **Resonators and impedance matching networks;**
- ❑ **Sinusoidal oscillators and voltage controlled oscillators (VCO);**
- ❑ **Power amplifiers;**
- ❑ **Mixers for up and down frequency conversion;**
- ❑ **Phase Locked Loops (PLL);**
- ❑ **Low noise amplifiers.**

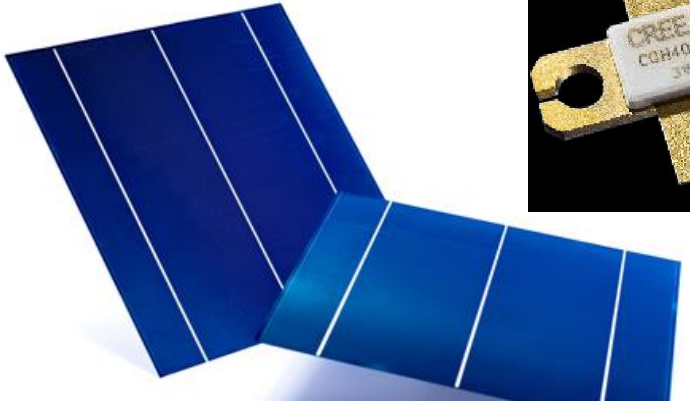
ELECTRON DEVICES AND COMPONENTS

- The course **explains the operating principle of a wide set modern semiconductor devices for diverse applications** (diode, BJT, HBT, MOSFET, MESFET, HEMT, LED, APD, Solar cells) with **emphasis on the relation between technology, material properties, device design and performance metrics.**
- Students will gain an intuitive understanding of electron devices with an **extensive use of electron device simulation tools** Lab demos of device characterization equipments complement front lectures and simulation labs.
- Prerequisites: none. The course is self-contained



TRANSISTORS

SOLAR CELLS



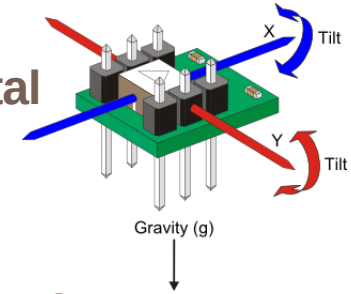
LIGHT EMITTING DIODES (LED)

ELECTRONIC INSTRUMENTATION AND SENSORS

- Course program
  - Architecture and characteristics of measurement instrumentation for signal analysis in frequency domain: DTFT and digital spectrum analyzer, analog spectrum analyzer, Vector Network Analyzer.
  - Principle of operation and realization of sensors for the main physical quantities: temperature sensors, pressure and flow rate, MEMS inertial sensors, linear and angular position, level sensors, current sensors
  - Design of electronic circuits for sensors signal conditioning

ELECTRONIC INSTRUMENTATION AND SENSORS

- Acquired skills
  - Set up of instrumentation to perform correct harmonic analysis.
  - Full comprehension of manuals of spectrum analyzers and VNAs.
  - Knowledge of working principles of sensors for the main physical quantities.
  - Design of conditioning circuits and interfacing sensors to digital acquisition devices.

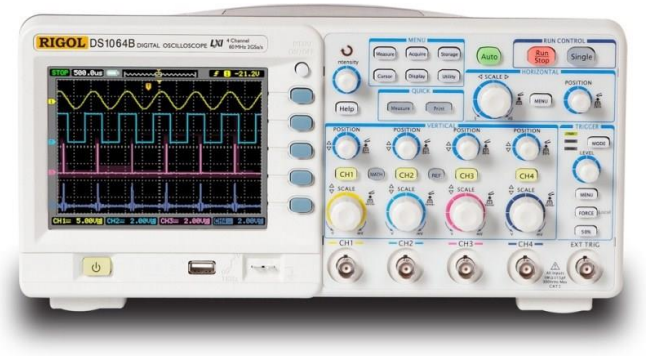


- Hands on and lab assignments
  - All the lectures are held in electronic lab, after each topic the students use the instruments with «hands on» sessions and verify the acquired concepts
  - At the end of the course, a 30-hours lab assignment is given where students must realize a sensor (the measurand changes every year) or a voltmeter (hardware+firmware+software)

ELECTRICAL AND ELECTRONIC MEASUREMENTS

Course program

- Measure and estimation and uncertainty evaluation in direct and indirect measurements.
- Architecture and characteristics of measurement instrumentation: analog oscilloscope, digital oscilloscope, digital multimeter in AC and DC measurements, frequency and period counters.
- Impedance measurements: substitution, volt-amperometric, bridges. AC and DC impedance bridges, auto-balancing LCR bridges.
- Automatic measurements through calculator and IEEE 488.
- Electronic components characterization: non idealities in OPAMPs, ADCs and DACs.

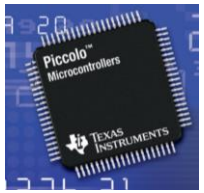


ELECTRICAL AND ELECTRONIC MEASUREMENTS (1ST SEM.)

- Acquired skills
  - Use of general purpose instrumentation.
  - Set up of basic electronic measurements.
  - Set up of an automatic measurements bench
  - Expression of measurement results.
  - Reading and understanding instrumentation specifications.
- Hands on and lab assignments
  - All the lectures are held in electronic lab, after each topic the students use the instruments with «hands on» sessions and verify the acquired concepts
  - At the end of the course, a 30-hours lab assignment is given where students must realize a sensor (the measurand changes every year) or a voltmeter (hardware+firmware+software)

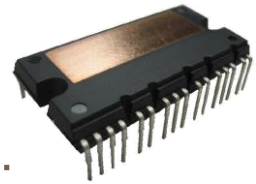
ELECTRICAL DRIVES I AND II

MAIN ACQUIRED SKILLS/COMPETENCES



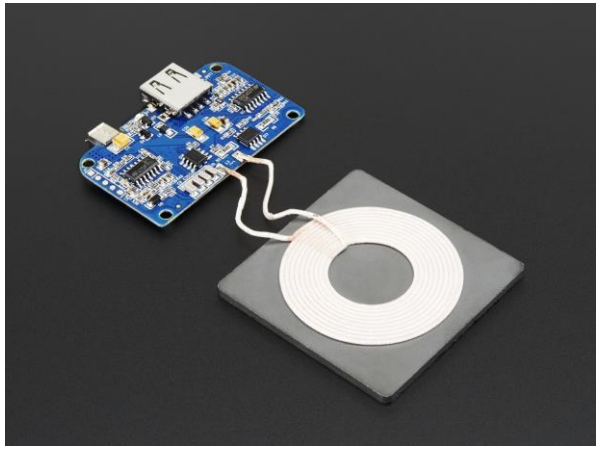
- understand how **electrical energy can be converted efficiently to mechanical one and vice-versa** (i.e. how electric machines (= motors and/or generators) work)
  - electric **motors structure and operating principles**;
  - electric motors **dynamical models** and control issues;
  - **digital control algorithms** design (analytical and simulation);
  - digital control algorithms **implementation** (by means of digital signal micro controllers, FPGA and Systems on Chip);

- understand **how power electronic converters can be used to feed electric motors and to interface with the electric distribution grid**:
  - standard and **innovative power electronic converters**;
  - **digital control** of power electronic converters;
  - simulation and implementation of **converter controllers**.



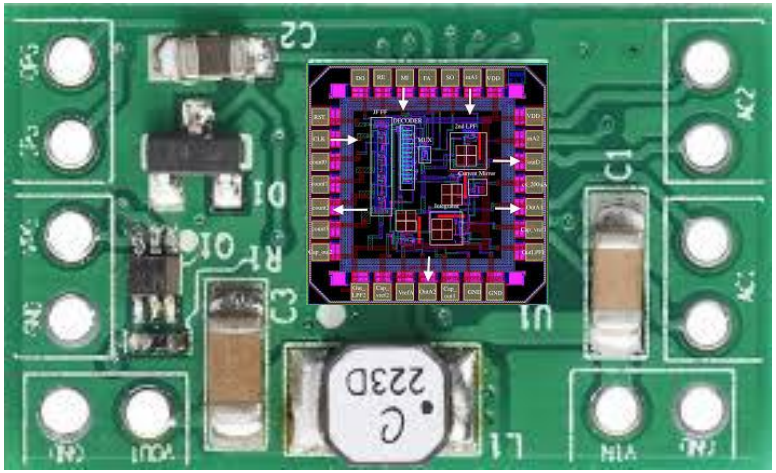
INDUSTRIAL ELECTRONICS

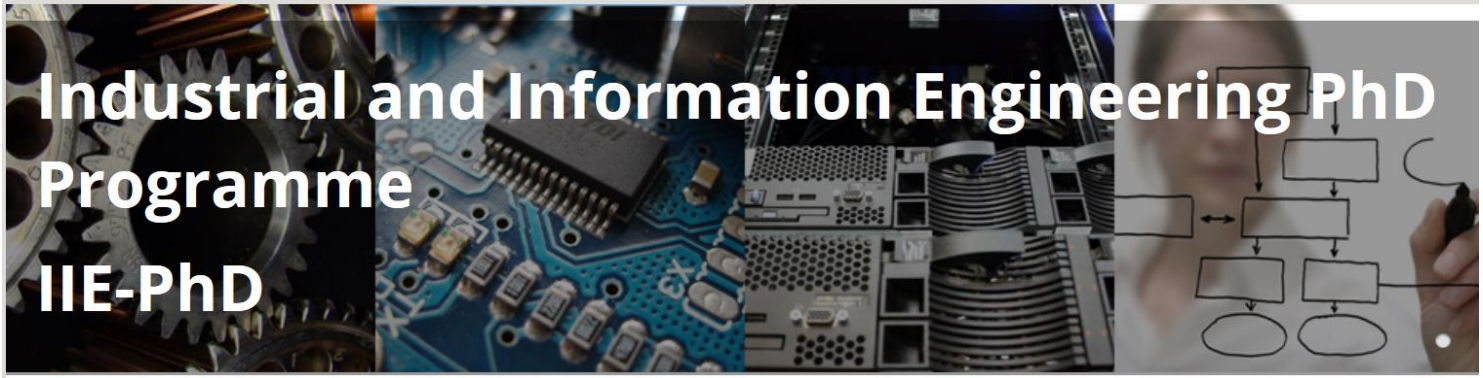
Knowledge and understanding of circuit an systems used for energy conversion applied from industrial automation equipment to portable systems.



POWER ELECTRONICS

Knowledge and understanding of power management system design strategies at System level and Circuit/IC level





Double-degree with INP-Grenoble