Master of Science
ESECA

Director, INPT-N7 coordinator : Julien PERCHOUX
INSA coordinator : Etienne SICARD
Contact : julien.perchoux@n7.fr
master.eseca@n7.fr
FACTS

✓ 4th French city (~1 million inhabitants)
✓ 2000 years of history
✓ At the feet of the Pyrenées
✓ Capital of the French gastronomy
✓ Home of the north hemisphere most awarded rugby team
✓ Home of the French and European aeronautics industry
TOULOUSE : HOME OF THE EUROPEAN AERONAUTICS

- Home of the AIRBUS company
- Main CNES (National Center for Space Study) facility – part of the European Space Agency
- Home of meteofrance the French meteorology agency
- A complete network of companies (Thales, Safran, Honeywell, Intespace,...) and research labs (CESBIO, IRAP,...)
TOULOUSE is a major position in new technology R&D

- with leading companies: Continental, NXP, AIRBUS, ...
- with innovating start-up: SIGFOX
- with major government funded labs: LAAS-CNRS, LAPLACE, IRIT,...

TOULOUSE is an attractive city for students

- Awarded as French preferred city by students
- 100,000 students: 2nd largest student pop. after Paris
- 14,000 international students
- Most important Engineering schools concentration
INPT – National Polytechnic Institute of Toulouse
The “7 campus university”

Agronomy (2 sites), Chemical engineering, Veterinary, Meteorology, Mechanical engineering and Electrical Engineering (ENSEEIHT)

INSA – National Applied Sciences Institute
An Engineering school with a national and international network
5 sites in France + 1 in Morocco
Masters of Science and Technology

6 masters dedicated to foreign students
An illustration of the best filed of expertise at INPT and INSA

- Agrofood chain
- Electrical Engineering Systems
- Fluids Engineering for Industrial processes
- Water Engineering and Water Management
- Green Chemistry and Processes for Renewable Feedstocks
- Industrial and Safety Engineering Systems
- Electronic Systems for Embedded and Communicating Applications
Objectives of the master ESECA

✔ To enroll top-level worldwide students in the field of electronics

✔ To provide top-level and most up-to-date teaching:
  ✔ In electronics for embedded systems
  ✔ In relation to the aeronautics industry
  ✔ In tight relation with research activities

✔ To graduate students that will:
  ✔ take part in the research labs as PhD or R&D engineers
  ✔ Build an International career
ESECA: Electronic Systems for Embedded and Communicating Application

Integration semester (365 h)
Basics of Electronics, Electromagnetism and Signal

Core semester (425 h)
Advanced Electronics, RF electronics and Signal
Basics of Embedded Systems

2 month intermediary internship

Specialization semester (440 h)
Advanced courses in Embedded Systems
Including Research project (100 h)

6 month final internship
INTEGRATION SEMESTER:
- Extra-scholar support (paperwork, housing, bank,…)
- Intensive French lectures
- Dedicated lectures, tutorials and practicals (small groups) in mathematics, electronics, electromagnetism and signal processing.
- Coding C, µ-controller, DSP

CORE SEMESTER
Lectures, Tutorials and practicals
- advanced level (intensive): digital electronics (VHDL, FPGAs), RF electronics, signal and image processing
- fundamentals: mechatronics, telecoms
SPECIALIZATION SEMESTER
- Mobile autonomous systems
- Power Management
- Radar & remote sensing
- Telecoms

Intensive laboratory sessions
- Clean room facilities
- Industrial lecturers

RESEARCH PROJECT
100h in one of the many research institutions of Toulouse (LAAS-CNRS, LAPLACE, IRIT,...)

FINAL INTERNSHIP
6 month in a research lab. or a company
## Detailed semester 7

<table>
<thead>
<tr>
<th>Teaching Unit</th>
<th>Courses</th>
<th>ECTS/ UE</th>
</tr>
</thead>
</table>
| Social Science & Culture | ● French (FLE)  
                            ● Conferences on aeronautics  
                            ● Communication            | 4        |
| Math/Programming         | ● Maths Fourier Analysis  
                            ● Maths - Complex variable – Vector analysis  
                            ● Maths Probability/ Statistics  
                            ● Basis of Programming/ Matlab  
                            ● C programming  
                            ● Microprocessor            | 12       |
| Circuits                 | ● Circuits  
                            ● Project Analog Electronics  
                            ● Analog Electronics Practical  
                            ● Semic-conductor devices  
                            ● Digital electronics  
                            ● Filtering  
                            ● Transmission lines       | 14       |
<table>
<thead>
<tr>
<th>Teaching Unit</th>
<th>Courses</th>
<th>ECTS/ UE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Science &amp; Culture</td>
<td>• French (FLE) • English • Conferences on aeronautics • Industrial project</td>
<td>6</td>
</tr>
<tr>
<td>Digital Electronics</td>
<td>• VHDL • Front-end acquisition • Digital Electronics project</td>
<td>6</td>
</tr>
<tr>
<td>Telecom</td>
<td>• Optoelectronics • Telecoms • Practical Hyper / Opto</td>
<td>5</td>
</tr>
<tr>
<td>RF</td>
<td>• Antennas • Passive RF • Active RF circuits</td>
<td>3</td>
</tr>
<tr>
<td>Signal and Image</td>
<td>• Signal processing • Digital signal processing • Image processing • Signal &amp; Image processing project</td>
<td>4</td>
</tr>
<tr>
<td>Mechatronics</td>
<td>• MEMS • SIP PROJECT • Laser and optical fiber sensing techniques</td>
<td>6</td>
</tr>
</tbody>
</table>
## Detailed semester 9

<table>
<thead>
<tr>
<th>Teaching Unit</th>
<th>Courses</th>
<th>ECTS/ UE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHS</td>
<td>● French (FLE) &lt;br&gt; ● English &lt;br&gt; ● Internship presentation &lt;br&gt; ● Research project &lt;br&gt; ● Conferences on aeronautics &lt;br&gt; ● Relation with enterprises</td>
<td>9</td>
</tr>
<tr>
<td>Embedded Systems</td>
<td>● SoC &lt;br&gt; ● Architectures, interfacing and reliability of ES &lt;br&gt; ● Mobile autonomous platform project &lt;br&gt; ● Digital IC project &lt;br&gt; ● MMIC &lt;br&gt; ● Payload architecture</td>
<td>11</td>
</tr>
<tr>
<td>Power Management</td>
<td>● Integrated DC-DC Converters &amp; regulation principles &lt;br&gt; ● Drivers and switching management &lt;br&gt; ● Multiphase converters &lt;br&gt; ● EMC of Integrated Circuits</td>
<td>4</td>
</tr>
<tr>
<td>Radar and Remote Sensing</td>
<td>● Radar signals &lt;br&gt; ● Remote sensing project &lt;br&gt; ● RADAR equipment</td>
<td>3</td>
</tr>
<tr>
<td>Telecoms</td>
<td>● Photonics for HF &lt;br&gt; ● Project Embedded optical links &lt;br&gt; ● Signal for telecommunication &lt;br&gt; ● Space telecoms</td>
<td>3</td>
</tr>
</tbody>
</table>
Support

Educational teams
- Department of electronics of N7
- Department of Electrical & Computer Engineering of INSA

Associated laboratories
- LAAS-CNRS (Microelectronics, Sensors, IoT, Robotics)
- LAPLACE (Energy, Plasmas, Microwave)
- IRIT (Image/Signal Processing, Telecoms)

Industrial speakers and tutors
- Airbus
- Thales
- NXP
- etc....
Majority of PhD student (42%) Amongst them mostly private companies (Thales, Technicolor, Schneider,...)

39% work as R&D engineers - mostly small business companies
Double diplomas

- NTU (Taipei, Taiwan)
- USFQ (Quito, Ecuador)
- DTU (New Dehli, India)

M1 in home University
M2 in Toulouse

→ Direct recruitment at the M2 level
What they say!

**Rafael, Venezuela:** The master ESECA provides continuity with knowledge and expertise in telecommunications already acquired in my country.

**Lavinia, Romania:** I have chosen France because of my precedent Erasmus experience in Toulouse. Moreover, this program of Master is very well focused on my preparation as well as on the knowledge I wanted to gain during my Master studies.

**Patricia, Mexico:** The Erasmus coordinator had told me of this Master and I wanted to take the opportunity. The content is very interesting, as well as the internship.

**Chetan, India:** I am very satisfied with what I have learnt during the Masters. There is a strong cohesion between the subjects taught at the school and the current demands in the industry. A fine balance was struck between the theoretical courses and the hands-on practicals. The presence of researchers and labs is also very beneficial and necessary. It helped me develop an approach towards analytically responding to a problem.

**Chung, Vietnam:** I got a scholarship from the Ministry of Education to do a master abroad. I chose France because it is a country of ancient culture and the study conditions are favorable. In addition, it is considered one of the best educational places in the world.