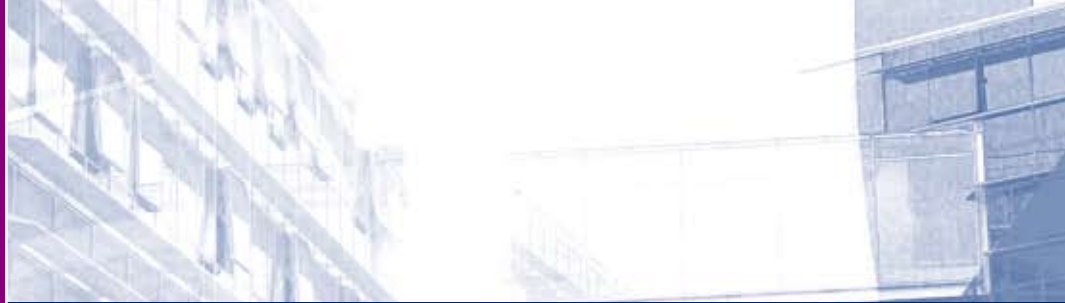


EMNantes



AII

**Control Engineering
and Industrial Information
Technology**



ECOLE DES MINES DE NANTES

The AII option



In this option, students learn the skills needed to develop and monitor automated systems. These skills include modeling and simulation to understand how the systems work; instrumentation and industrial information technology to collect, process and transmit information in real time; finally control engineering to design the systems. AII engineers have a global vision of systems and play a key role in all phases of project management, including design, development, implementation, installation and maintenance. Their work also involves taking into account all factors, including human factors.

> Career Opportunities

Thanks to technological progress (increasingly powerful digital control systems), and organizational improvements (project structure) there is a growing industry demand for AII engineers. Since this option was created in 1995, graduates have found two major types of job opportunities. Half the graduates have found jobs with large corporations (PSA, Matra, Alstom, Dassault, CNES, Renault, etc.) and sometimes with innovative SMEs. One third of the graduates have joined IT engineering and consulting firms (BII, IPSIS, Auxilio, Altran, etc.). Others have been hired by information and communication technology firms.

> Jobs for Tomorrow and the Future

Traditional jobs include:

- Technical sales engineer,
- Control engineer,
- Modeling engineer,
- Test and validation engineer,
- Development engineer.

After a few years, most engineers move into:

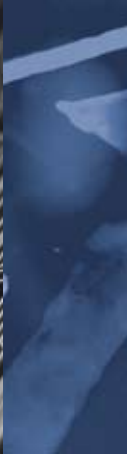
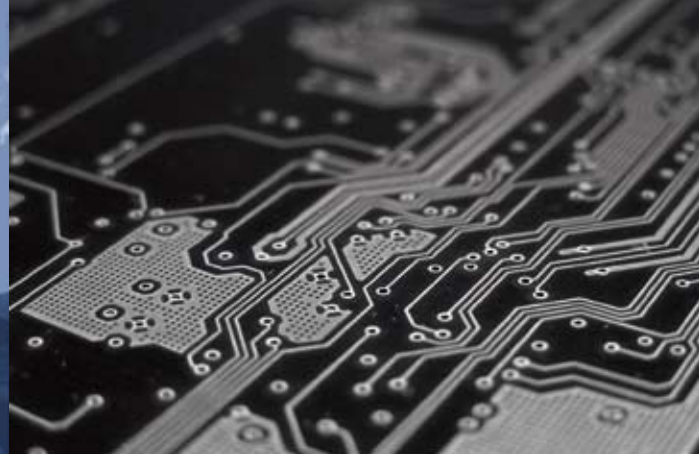
- Project leadership positions,
- Specific expertise (research engineer, then senior engineer, R&D manager),
- Customer support (marketing, training, sales / pre-sales).



Mohamed Yagoubi,
Program Head.

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“AII is different from the Control Engineering programs at most other engineering schools in two ways. First, it does not focus on one specialty, but covers all the different components of systems engineering. Second, it teaches skills ranging from design to implementation based on modeling, control and information technology. Our engineers are therefore well-rounded, capable of adapting to different environments and working in any number of different fields.”



> The Program

The curriculum provides diverse skills so that the engineering graduate can easily work on a variety of projects, products, and phases in a product's life cycle, and be as comfortable working in product development as in process development.

In the 1st and 2nd year of specialization, the scientific and technical courses teach the following essential:

- **System modeling**
- **System control**
- **System control and optimization**
- **Mechatronics**

Professionals from industry present case studies or complementary topics (neural networks, fuzzy logic, etc.) at seminars on practical applications (automotive, aviation, etc.).

Projects (international project and specialty project) are key features of the program.

The AII option builds on the instruction provided in the previous cycles on theoretical and technical aspects, to cover the different components of systems engineering. The curriculum includes courses specific to the option in Social and Management Sciences.

MODELING AUTOMATED SYSTEMS

Using systems modeling/simulation methodologies

Identifying a model

Testing and validating a model

ANALYZING AND CONTROLLING SYSTEMS

Analyzing and diagnosing systems

Using control system methodologies

Measuring and improving system performances

Testing and validating a control or supervision system

DESIGNING INDUSTRIAL CONTROL OR SUPERVISION SYSTEMS

Specifying and designing an industrial control system

Ensuring communication among several subsystems

Testing and validating an industrial control system

INTERPRETING ORGANIZATIONAL DYNAMICS AND WORKING IN A SOCIO-ORGANIZATIONAL CONTEXT

> Beyond Borders

The international project conducted in collaboration with students from the University of Lund in Sweden or Tec de Monterrey in Mexico, is an initial opportunity for the students to develop their skills in an intercultural environment. All students perform a 3-month internship in a foreign research lab or company, and may even complete an entire year of study in a foreign university with credit transfer. In



> Double degrees



“Excellent grounding in all the engineering sciences”

Vincent Thomas,
Engine Business Unit Manager at Imagine

“Our company has developed the AMESim simulation platform, offering tools and services for the design and analysis of systems as a whole. We work for example with the automotive industry in a variety of fields, providing solutions for engines, transmission, thermal management systems and injection systems. In 2006, we chose Xavier Duprez to work on the development of an estimator. This involves using a simple physical model to evaluate a physical value that we cannot measure directly because there is no related sensor. In this case, his work involved estimating the mass of residual gas in the cylinders, which is essential information for controlling combustion.

For this assignment, we needed a person with an excellent grounding in all the engineering sciences, because we deal both with fluid mechanics and thermodynamics, and of course someone meticulous when it comes to scientific methods. Engines are a very particular and specialized field, which required a considerable prior investment in terms of bibliographic research. That is what's hard about working with us: we work on multi-domain systems, but we need fast results.”

terms of double diplomas, AII is a special partner of the Georgia Institute of Technology and also offers study opportunities with prestigious universities, including Shanghai Jiaotong University (China), Universidad de Los Andes (Columbia), Ecole Polytechnique de Montréal (Canada), and Tec de Monterrey (Mexico). Finally, the international dimension is emphasized by the presence of students from other cultures (China, USA, Columbia) completing the entire program in France.

> Research

In addition to these double degrees, the students also have access to different master's degrees. The “Control Engineering and Production Systems” master program is co-accredited by the Ecole des Mines of Nantes, the Ecole Centrale and the University of Nantes, at the same time as the 2nd year of specialization thanks to equivalencies. The classes are held at the IRCCyN (Nantes Cybernetic and Communication Research Institute). Some students who have earned their masters have continued in the field of research, in particular in the frame of CIFRE PhD programs.



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