Undergraduate Technological Degree

ELECTRICAL ENGINEERING
AND INDUSTRIAL COMPUTING (EEIC)

Association
des Directeurs
d'IUT

Preamble

Technologies related to the field of Electrical Engineering and Industrial Computing (EEIC) are part of our daily lives.

Electricity is present in most home appliances: in your personal computer, microwave oven, washing-machine or LCD screen. It is the backbone of our means of transport (high-speed trains, the underground and, in the near future, electrical cars). In industrial companies, it powers the machines which turn matter into products. Electrical Engineering pertains to the production of this electrical energy (power stations, renewable energies), to its distribution and its use (in engines and all actuators)

Besides, all these devices are « smart »: this allows the best possible use of your microwave oven, the control, from your dashboard, of the level of comfort inside your vehicle; this also enables a robot to work autonomously. Industrial Computing is about the digital processing of data, and the systems (wired or programmed) which carry out this processing.

The course of study preparing you for a *DUT* (Undergraduate Technology Degree) in Electrical Engineering will give you the practical knowledge and professional skills applicable to these technologies. It is devised by a community made up of teachers and industry professionals cooperating together.

1. Course Objectives

EEIC graduates fulfill their activities in the traditional fields relating to electricity, electronics, industrial computing and their applications, such as:

- Electric and electronic industries
- Production and transport of energy
- Telecommunication
- Information and communication technologies

With the generalization of these technologies, the skills of *DUT* graduates in electrical engineering are also applicable to such varied fields as:

- Transforming and manufacturing industries
- Energy management
- Transport and automobile
- Aerospace and defense
- Construction and building industry
- Health services
- Food-processing and agribusiness industries

Recent studies have predicted a significant growth of activity in the fields of electronics and industrial computing. Indeed, the concept of “digital factory”, which so far had been the privilege of large companies, should expand rapidly to small and medium-sized businesses, as well as to traditional economic fields. This concept, which aims at reducing the cycle of purchase-development-production-industrialization-services, relies on a growing integration of the different services and functions of the company through computer networks. These innovations will accentuate the expansion of computer links in a process of extensive company, and accelerate the virtual modeling of products and processes.

The EEIC course trains qualified technicians whose activity depends, for the most part, on the type of company they work for; their work will be specific in a large company, broader and more varied in a small company or a research laboratory.

The jobs of electronics technician, electro-technical engineer, automatism specialist or computer scientist cover a wide variety of specific positions: technician in study and conception (ROME code : H120X), quality control technician (ROME code : H1504), automated fittings technician (ROME code : H2603), installation and maintenance technician (ROME code : H130X), account manager (ROME code : H110X), to quote only the most important positions.

The *DUT* graduate in electrical engineering will also be able to continue his or her studies in short courses such as professional Bachelor's degrees, but also long courses to prepare for a Master's degree or an engineering degree.

The assets of the EEIC course of study are numerous. In particular,

- The 10-week internship within a company that takes place at the end of the 2-year studies is the culmination of a training that prepares for autonomous work, notably through the carrying out of projects taking place throughout the whole course of study.
- General and scientific knowledge covering a wide variety of subjects, enabling students to grasp the wider context when they work on projects.
- The EEIC student is invested in his own training by choosing certain modules that are coherent with his personal and professional project (PPP). This choice helps them be successful in graduating, and then in their integration into the workplace or in continuing their studies.

2. Activities and Skills Tables

The activities and skills tables list the activities the *DUT* EEIC graduate is able to undertake when their course of study is completed; for each of them, one or several skills are to be used.

These activities/skills are classified into two levels:

- Basic skills/activities corresponding to the core knowledge of electrical engineering
- Specific skills/activities determined by the options chosen by the student when elaborating their personal and professional project

Besides their technical skills, *DUT* graduates have to evolve into an open environment where communication is essential to the realization of their work. They are therefore able to draw up and interpret professional documents, and also communicate in French as well as in English. They are also able to use collaborative tools in order work in teams efficiently.

DUT graduates are also able to deal with a project from every angle. To that end, they know how to examine the technical and economic feasibility, and implement the appropriate methodological tools. They have the ability to abide by the mission statement, with the associated deadline and the environmental and economic constraints. They are also able to take into account the current rules and standards, as well as the technical environment, the quality, hygiene, and security.

Finally, they are prepared for working in teams, which implies the capacity to collaborate and manage their schedule while working autonomously.

a. Activities and basic skills.

ACTIVITIES	SKILLS (BEING ABLE TO)
MAKING ELECTRIC OR AUTONOMOUS ELECTRONIC SYSTEMS, OR SYSTEMS DEDICATED TO THE CONTROL AND COMMAND OF MULTI-TECHNOLOGICAL GROUPS	• Implement the basic (analogue, digital) electronic components (functions) to make a sub-group : choose them, link them • Combine sub-groups (electric or electronic) electrically as well as functionally • Validate the correct functioning of a sub-group or a group (measuring) • Use an electronic cad tool (schematics, positioning, routing) • Choose and implement a production technique for electric or electronic equipment and draw up the formula
INSTALLATION AND MAINTENANCE OF AUTONOMOUS ELECTRIC OR ELECTRONIC SYSTEMS, OR SYSTEMS DEDICATED TO THE CONTROL AND COMMAND OF MULTI-TECHNOLOGICAL GROUPS	• Respect the manufacturers’ documentation • Diagnose a system failure • Identify the necessary resources for solving a system failure • Solve a system failure

DEVELOPMENT OF SMALL EMBEDDED SYSTEMS (LIMITED TO MODERATELY COMPLEX CASES)	• Model a system within its environment • Perform software development through its various stages (analysis, algorithm, coding, testing) • Use a tool for cross development • Use a language of material description of circuits (design, simulation) • Integrate hardware and software together
DEVELOPMENT OF AUTOMATISM APPLICATIONS	• Work out the specifications of an automated installation according to the mission statement • Choose the appropriate automatism components • Perform the functional analysis of the installation and make an automatism program based on that analysis • Place automatism in its controlling environment : automated production system (databases), communication networks
TESTING, QUALIFICATION OF AUTONOMOUS ELECTRIC OR ELECTRONIC SYSTEMS, OR SYSTEMS DEDICATED TO THE COMMAND AND CONTROL OF MULTI-TECHNOLOGICAL GROUPS	• Choose the controlling or testing equipment to check conformity with technical requirements • Define the testing procedures and methods, and perform the analysis of non-conformity of products • Analyze the measuring results, diagnose the causes of failure and carry out the modifications necessary for product compliance • Analyze the structure of hardware and software testing tools, analyze functional and in situ benchmarks
OPERATING OF A MULTI-TECHNOLOGICAL CLOSED-LOOP CONTROL SYSTEM (CONTINUOUS PROCESSES)	• Take into account the modeling of an industrial system and evaluate the static and dynamic performances of a simple analogue or digital system • Implement and set the parameters of an industrial regulator
DOING TECHNICAL WATCH STUDIES	• Find and describe any technological and scientific evolution • Adapt to the evolution of jobs • Select information in a relevant way (notably on the internet)

b. Specific activities and skills

ACTIVITIES	SKILLS (BEING ABLE TO)
DEVELOPMENT (FOR SMALL-SCALE PROJECTS), INSTALLATION, MAINTENANCE OF SYSTEMS OF ELECTRICAL ENERGY PRODUCTION	• Find and describe the structure of electronic systems of conversion and energy transformation • Master the different technologies of production and energy storage
DEVELOPMENT (FOR SMALL-SCALE PROJECTS), INSTALLATION, MAINTENANCE OF ENERGY CHAIN FOR OPTIMAL ENERGY USE	• Find and describe a complex multi-technological system combining functions of distribution and energy management • Describe the global structure and the various links in the chain, from production to consumption and vice versa • Work in a safe environment (electrical enabling)
DEVELOPMENT (FOR SMALL-SCALE PROJECTS), INSTALLATION, MAINTENANCE OF ELECTRONIC SYSTEMS (LOW LEVEL SIGNAL) DEDICATED TO INTERFACE MANAGEMENT AND COMMUNICATION	• Find and describe the specificities of hardware and software structure dedicated to signal processing • Identify the various standards of transmission/frequency spectrums
DEVELOPMENT (FOR SMALL-SCALE PROJECTS), INSTALLATION, MAINTENANCE OF INDUSTRIAL COMMUNICATION SYSTEMS	• Implement low level communication technologies
DEVELOPMENT OF SMALL, COMPLEX EMBEDDED SYSTEMS	• Separate an application into different tasks (inter-process communication) • Program an application around a real-time operating system • Implement an asic/fpga structure
OVERSEEING AN INDUSTRIAL INSTALLATION	• Place automatism in its controlling environment : automated production system (databases), communication networks

3. General organization of the course

a. Description of the course

The course leading up to the EEIC Undergraduate Technology Degree is organized full-time over 4 semesters and also with university course combined with work experience, and with special year. The EEIC *DUT* is also accessible with Validating Acquired Experience (VAE)

This course includes 3 educational units per semester, each one being made up of modules: those preparing for the core skills of electrical engineering on the one hand, and complementary modules chosen by the student on the other hand.

Complementary modules are meant to complement the student's training, whether he or she wishes to integrate the world of work or to carry on studying in other courses provided by higher education.

The course is composed of lectures (attended by the whole class), supervised work (with groups of 26 students) and practical work (half of a supervised work group, unless there is a specific mention relating to the students' safety) depending on the number of classes defined by the modified 03/08/2005 order concerning the *DUT* (DUT) within the European framework of higher education.

The 1,800 hours of supervised training, complemented by core learning training, are defined as follows:

SCHEDULE FOR THE 4 SEMESTERS

LECTURES	*SUPERVISED WORK*	*LANGUAGE, EXPRESSION, COMMUNICATiON (SUPERVISED OR PRACTICAL WORK)*	*PRACTICAL WORK*	*TUTORED PROJECTS*	*INTERNSHIP*
324 HOURS	528 HOURS	300 HOURS	648 HOURS	300 HOURS	10 WEEKS MINIMUM

The 1,800 hours of supervised training added to the 300 hours of tutored projects are spread over a minimum of 60 weeks. The « Language, Expression, Communication » course includes classes devoted to English, Expression and Communication, Personal and Professional Project, and to Company Knowledge.

b. General table of modules and Educational Units (UE) per semester

The syllabus of the first three semesters of the training includes 3 topics ,corresponding to 3 Educational Units per semester :

- .Topic 1 : components, systems and applications
- .Topic 2 : Innovation through technology and projects
- .Topic 3 : human development and scientific training

The skills a graduate should possess are developed as he or she progresses in his or her training by combining the already acquired academic knowledge (theoretical and practical, mainly in topic 1 and 3), and projects in which the student learns his or her future job (mainly in topic 2). Topics correspond for each semester to Educational Units with the following progression: Introduction in Semester 1, Development in Semester 2, Deepening in Semester 3, Strengthening in Semester 4.

The last semester is comprised of 3 Educational Units:

- UE41 : Internship
- UE42 : Innovation through technology and projects – Strengthening

- UE43 : human development and scientific training – Strengthening

THESE TOPICS BREAK DOWN AS FOLLOWS OVER THE 4 SEMESTERS

COURSES	*S1 INTRODUCTION*	*S2 DEVELOPMENT*	*S3 DEEPENING*	*S4 STRENGHTENING*	*TOTAL*
TOPIC 1 : COMPONENTS, SYSTEMS AND APPLICATIONS	240 HOURS	240 HOURS	240 HOURS		**720 HOURS**
TOPIC 2 : INNOVATION THROUGH TECHNOLOGY AND PROJECTS	150 HOURS	135 HOURS	150 HOURS	180 HOURS	**615 HOURS**
TOPIC 3 : HUMAN DEVELOMENT AND SCIENTIFIC TRAINING	120 HOURS	135 HOURS	120 HOURS	90 HOURS	**465 HOURS**
(UE41 : INTERNSHIP)					
TOTAL HOURS OF SUPERVISED TRAINING	**510 HOURS**	**510 HOURS**	**510 HOURS**	**270 HOURS**	**1,800 HOURS**