Electromechanical Engineering

International Private Higher Polytechnic School of Sousse (EPI)

The training in electromechanical engineering has an orientation or development council:

●Total number of members: 4

●Number of representatives from the economic world: 2

●Frequency of meetings: 2 to 3 meetings per semester

The Electromechanical Engineer at the International Multidisciplinary School EPI-Polytechnique Sousse acquires training including the fundamental aspects, as well as cutting-edge news, of electricity and mechanics.

It designs and tests equipment in various sectors such as energy, aeronautics, production, IT, biomedical, robotization, etc.

The fields of involvement of the versatile engineer cover a wide range of professional activities:

- Master the necessary tools for the production and development of electromechanical systems.
- Lead projects integrating the design, construction and analysis of systems in industrial and economic environments.
- Manage and mobilize human resources and material resources
- Must possess a set of technical, economic, social, etc. knowledge

To this end, this engineer is called upon to:

- Estimate manufacturing costs,
- Monitor the manufacturing, assembly, verification and maintenance of products,
- Ensure the assembly of prototypes and the manufacturing, testing and installation of devices to ensure high quality manufacturing.

- take care of writing guides for the evaluation, operation and maintenance of installations.

Ensure that the designed product meets safety and quality standards as well as technical specifications.

Skills framework : what skills are certified at the end of the training?

The Department of Electromechanical Engineering of the International Multidisciplinary School of Engineers of Sousse (EPI-Polytechnique) provides training for multidisciplinary engineers in the fields of electrical and mechanics. The objective of the training is the acquisition and mastery of theoretical and practical knowledge.

After solid basic training in Electromechanical Engineering acquired during the first four semesters, engineering students choose from three career paths :

- Automatic and mechatronics.
- Aeronautics.
- Industrial maintenance.

At the end of one semester of courses in their course, the engineering student completes their training with a one-semester End of Study Project (PFE) in industry.

Along with basic training skills (Mathematics, Computer Science, Languages, Human Resources Management, Entrepreneurship, Human Law, etc.), we find skills in the fields of Mechanics (Fluid Mechanics, Solid Mechanics, Mechanics continuous media, Materials and structures, Resistance of materials, Vibration mechanics, Thermal, Thermal machines, Mechanical design, CAD, Metallic structures and welding processes, Production techniques and MOCN, Hydraulic and pneumatic systems, etc.); Electrical (Electrical circuits, Electrotechnics, Automation, Signal processing, Robotics and Micro controller , machine control, etc.) and Industrial (Quality - Certification - Standards, Organization and Management of Production, ERP / CAPM, Lean manufacturing , Control and reliability/CMMS, Maintenance Tools, Safety of industrial installations,...).

Basic skills

- Mastery of an approach to applying a set of concepts and techniques from applied sciences;
- Mastery of an application approach based on fundamental science concepts relevant to engineering;
- Mastery of the equipment design process and processes ;

- Development of intellectual skills linked to research and innovation, knowledge of prevention and maintenance techniques;
- Demonstration of professional ethics and communication skills ;
- Ability to demonstrate creativity and be a vector of innovation;
- Awareness of the impacts of its technology;
- Acquisition of basic dexterity in handling equipment.
- Ability to integrate into an organization, commitment and leadership, project management.
- Ability to work in an international context: mastery of several foreign languages, economic training, cultural openness.

Scientific research skills

- Be able of to do a state of art of the works of research related has a thematic
- Se endows of the mind critical and of analysis of there literature
- Mastering deadlines and time management for an applied research project
- Working in a group

The skills of the Electromechanical Engineering specialty

Mechanical

Skill in the study, sizing and choice of elements of machines, industrial installations and products. Design of the architecture, the mechanical assembly of a system and the monitoring of its creation. Manufacture of prototypes, resolution of technical problems by carrying out computer simulations.

Electric

Skills in Electrical, Electronics in basic methods for the analysis, design, simulation, control and diagnosis of electrical systems. Ability to model a multi-physics system integrating sensors, actuators and their controls. Ability to choose and implement the best control strategy with digital or analog systems. Ability to define and optimize the order in terms of precision, speed, stability, robustness, etc. Ability to analyze, design and implement logical systems made up of electronic components, specific electronic circuits, computerized industrial systems, Industrial Programmable Controllers.

Industrial

Skills in the industrial field allowing you to lead a work group, plan and organize a production system, ensure quality management, maintain the reliability and safety of industrial equipment, lead continuous improvement workshops and prepare certification files.

Skills matrix: Electromechanics – Option: Mechatronics and automatics

Skill families	SKILLS	Level	Matter
Materials engineering	- Characterization of metallic materials; - Development and characterization of polymers; - Heat treatments of metallic materials; - Surface coatings of metallic materials.	1	Materials and structures; Formatting processes
Design of mechanical systems	- Sizing and Design of mechanical systems; - Systems modeling; - Design of structures;	2	MMC; RDM2; Solid mechanics; Vibration mechanics; Electromechanical design office; Mechanical concept ; CAD,
Production of metal parts and mechanically welded assemblies	- Production of metal parts by material removal. - Industrialization of parts by shaping the sheets; - Industrialization of mechanically welded assemblies unconventional processes .	2	Manufacturing processes ; Metallic structures and welding processes; Manufacturing analyses; Production techniques and CAM;
Choice and sizing of industrial installations	- Choice and sizing of hydraulic and pneumatic installations; - Analysis of thermal machines; - Design of industrial electrical installations - Control of production energy.	2	Electrical circuit ; Electrical engineering; Thermal; CAD electrical systems; Thermal machines; Modeling and management of electrical networks; Hydraulic and pneumatic systems;
Management and optimization of production systems	- Organization and layout of production stations and lines; - Planning and management of production operations; - Measurement and improvement of production performance; - Management of resources and quality control operations; - Management of resources and maintenance operations	1	Organization and Management of Production; ERP and CAPM; Lean Manufacturing ; Quality - Certification - Standards; Control and Reliability / CMMS;
Digital Mechanics / Digital Engineering	- Modeling and digital simulation of mechanical behavior; - Mastery and integration of industrial software ; - Reverse engineering	2	CAD; Production techniques and CAM; Numerical modeling ; IOT

Electrical engineering	- Knowledge in the field of electrical engineering and electrical networks; - Ability to implement electromechanical energy conversion systems; - Design and production of static electrical energy conversion systems (rectifiers, dimmers, choppers, inverters, etc.)	2	Electrical engineering; Modeling and management of electrical networks; Modeling, identification and monitoring; Machine control.
Automatic	- Modeling and identification of dynamic systems; - Analysis of continuous-time and discrete-time dynamic systems (precision, speed, stability , etc.); - Design and implementation of regulation solutions; - Synthesis of observers for the control and diagnosis of complex dynamic systems; - Advanced command law synthesis	3	Servicing and regulation ; Programmable controllers; Software for automation; Modeling, identification and monitoring.
Design of automated mechanical systems	- Design of automated systems; - Design of control and regulation solutions; - Design of electronic acquisition, control and display cards; - Design of robotic systems; - Analysis of robotic systems.	3	Analog electronic ; Servicing and regulation ; CAD electrical systems; Programmable controllers; robotics and microcontroller ; Analysis of robotic systems; Mechanism theory
General mechatronics	- Identification of the different parts of an automated production system; - Knowledge of communication protocols between control part and operational part; - Knowledge of sensor technology of the main physical sensors; - Design of peripherals and interfacing techniques ; - Handling of APIs (Industrial Programmable Automata).	3	General mechatronics; Sensor theory; Software for automation; Programmable controllers; IOT

Signal processing	- Broad knowledge of different types of signals; - Analyzes of signals in analog or digital form; - Mastery of the main common mathematical signal processing functions and their implementation in systems (software or hardware implementation);	2	Signal processing ; Numerical modeling ; Software for automation;
Mathematics and Computer Science	- Development of computer programs; - Manipulation of computer networks; - Mastery of conventional and unconventional optimization methods	1	Mathematics for engineers; Propability and statistics, MOS Certification ; IOT;
General skills	Communication in different languages, openness to the socio-economic environment, international openness, creativity, initiative, autonomy , spirit of self-training	2	English ; French ; Communication technique ; MOS certification , Entrepreneurship ; HRM; Right to work ; Internship ; PPE; PFA; PFE

Level 1: Basic *Level 2: Intermediate* *Level 3: Advanced*

Skills matrix: Electromechanics – Option: Aeronautics

Skill families	SKILLS	Level	Matter
Materials engineering	- Characterization of metallic materials; - Development and characterization of polymers; - Heat treatments of metallic materials; - Surface coatings of metallic materials.	1	Materials and structures; Formatting processes
Design of mechanical systems	- Sizing and Design of mechanical systems; - Systems modeling; - Design of structures;	3	MMC; RDM2; Solid mechanics; Vibration mechanics; Electromechanical design office; Mechanical concept ; CAD, Structural Mechanics.
Production of metal parts and mechanically welded assemblies	- Production of metal parts by material removal. - Industrialization of parts by shaping the sheets; - Industrialization of mechanically welded assemblies unconventional processes	2	Manufacturing processes ; Metallic structures and welding processes; Manufacturing analyses; Production techniques and CAM;
Choice and sizing of industrial installations	- Choice and sizing of hydraulic and pneumatic installations; - Analysis of thermal machines; - Choice and sizing of turbo machines; - Design of industrial electrical installations - Control of production energy.	3	Electrical circuit ; Electrical engineering; Thermal; CAD electrical systems; Thermal machines; Modeling and management of electrical networks; Hydraulic and pneumatic systems; Turbomachinery.
Management and optimization of production systems	- Organization and layout of production stations and lines; - Planning and management of production operations; - Measurement and improvement of production performance; - Management of resources and quality control operations; - Management of resources and maintenance operations	1	Organization and Management of Production; ERP and CAPM; Lean Manufacturing ; Quality - Certification - Standards; Control and Reliability / CMMS;
Digital Mechanics / Digital Engineering	- Thermal Modeling; - Mastery and integration of industrial software ;	2	CAD; Production techniques and CAM; Thermal Modeling; IOT

	- Reverse engineering		
Electrical engineering	- Knowledge in the field of electrical engineering and electrical networks; - Ability to implement electromechanical energy conversion systems;	2	Electrical engineering; Modeling and management of electrical networks;
Automatic	- Modeling and identification of dynamic systems; - Analyzes of continuous-time and discrete-time dynamic systems (precision, speed, stability); … - Design and implementation of regulation solutions;	2	Servicing and regulation ; Programmable controllers.
Design of automated mechanical systems	- Design of automated systems; - Design of control and regulation solutions; - Design of electronic acquisition, control and display cards; - Design of robotic systems;	2	electronics ; Servicing and regulation ; CAD electrical systems; Programmable controllers; robotics and microcontroller
Signal processing	- Broad knowledge of different types of signals; - Analyzes of signals in analog or digital form; - Mastery of the main radar emissions	2	- Signal processing ; - Radar theory
Aeronautics	- Master avionics tools and software; - Design and study the aerodynamic behavior of the numerous components of the aircraft's turbojet; - Develop calculation or computer software intended for use on board; - Ability to constantly monitor technological developments in your field; - Develop structures capable of reducing fuel consumption, the weight of the aircraft, or even maintenance costs; - Develop control devices and test them in real conditions	3	Aerodynamics; Combustion; Structural mechanics ; Flight mechanics; General avionics; Radar theory; Turbulence; Turbomachines; Aeroacoustics .

	- Understand the main requirements of aeronautical regulations.		
Mathematics and Computer Science	- Development of computer programs - Manipulation of computer networks; - Mastery of conventional and unconventional optimization methods	1	Mathematics for engineers; Propability and statistics, MOS certification , IOT ,
General skills	Communication in different languages, openness to the socio-economic environment, international openness, creativity, initiative, autonomy , spirit of self-training	2	English ; French ; Communication technique ; MOS certification; Entrepreneurship; HRM; Right to work ; Internship ; PPE; PFA; PFE

Level 1: Basic *Level 2: Intermediate* *Level 3: Advanced*

Skills matrix: Electromechanics – Option: Industrial Maintenance

Skill families	SKILLS	Level	Matter
Materials engineering	- Characterization of metallic materials; - Development and characterization of polymers; - Heat treatments of metallic materials; - Surface coatings of metallic materials.	1	Materials and structures; Formatting processes
Design of mechanical systems	- Sizing and Design of mechanical systems; - Systems modeling; - Design of structures;	2	MMC; RDM2; Solid mechanics; Vibration mechanics; Electromechanical design office; Mechanical concept ; CAD,
Production of metal parts and mechanically welded assemblies	- Production of metal parts by material removal. - Industrialization of parts by shaping the sheets; - Industrialization of mechanically welded assemblies unconventional processes	2	Manufacturing processes ; Metallic structures and welding processes; Manufacturing analyses; Production techniques and CAM;
Choice and sizing of industrial installations	- Choice and sizing of hydraulic and pneumatic installations; - Analysis of thermal machines; - Design of industrial electrical installations - Control of production energy.	2	Electrical circuit ; Electrical engineering; Thermal; CAD electrical systems; Thermal machines; Modeling and management of electrical networks; Hydraulic and pneumatic systems;
Management and optimization of production systems	- Organization and layout of production stations and lines; - Planning and management of production operations; - Measurement and improvement of production performance; - Management of resources and quality control operations; - Management of resources and maintenance operations - Mastery of analysis and production management tools; - Expertise and development of production processes.	3	Organization and Management of Production; ERP and CAPM; Lean Manufacturing ; Quality - Certification - Standards; Control and Reliability / CMMS; Optimization of production systems

Digital Mechanics / Digital Engineering	- Mastery and integration of industrial software ; - Reverse engineering	2	CAD; Production techniques and CAM ; , thermal modeling, IOT
Electrical engineering	- Knowledge in the field of electrical engineering and electrical networks; - Ability to implement electromechanical energy conversion systems; - Design and production of static electrical energy conversion systems (rectifiers, dimmers, choppers, inverters, etc.)	2	Electrical engineering; Modeling and management of electrical networks; Machine control.
Automatic	- Modeling and identification of dynamic systems; - Analysis of continuous-time and discrete-time dynamic systems (precision, speed, stability); … - Design and implementation of regulation solutions; - Synthesis of observers for the control and diagnosis of complex dynamic systems;	2	Servicing and regulation ; Programmable controllers ; Automatic in real time.
Design of automated mechanical systems	- Design of automated systems; - Design of control and regulation solutions; - Design of electronic acquisition, control and display cards; - Design of robotic systems;	2	Analog electronic ; Servicing and regulation ; CAD electrical systems; Programmable controllers; robotics and microcontroller .
Signal processing	- Broad knowledge of the different types of signals; - Analyzes of signals in analog or digital form;	2	- Signal processing ;
Maintenance and industrial supervision	- Identification of the different parts of an industrial system; - Mastery of data processing techniques and estimation of reliability indicators for the operational safety of an industrial system; - Knowledge of different approaches to monitoring and diagnosis of industrial processes	3	Maintenance tools; Repair technique; Non-destructive testing ; Safety of industrial installations; Optimization of production systems

	- Knowledge of the functionalities of industrial supervision systems - Knowledge and mastery of different industrial maintenance techniques and methods - Implementation and management of industrial systems.		
Mathematics and Computer Science	- Development of computer programs - Manipulation of computer networks; - Mastery of conventional and unconventional optimization methods	1	Mathematics for engineers; Propability and statistics, MOS certification; IOT
General skills	Communication in different languages, openness to the socio-economic environment, international openness, creativity, initiative, autonomy , spirit of self-training	2	English ; French ; Communication technique ; MOS certification ; Entrepreneurship ; HRM; Right to work ; Internship ; PPE; PFA; PFE

Level 1: Basic *Level 2: Intermediate* *Level 3: Advanced*