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Master courses ING 4

Common Subjects to all Specializations

To obtain 30 ECTS you must add the common subjects and the subjects of the specialization you selected.

Autumn Semester

| Course code | Course Title | ECTS Crédits | |
|-----------------------------------|--------------------------------|-----------------|--|
| Project Unit * | | | |
| INGPA-INF4000-10 | Project Management | 8 | |
| INGPA-PRJ4000-09 | Pluridisciplinary Team Project | | |
| LANGUAGES AND HUMAN SCIENCES UNIT | | | |
| INGPA-LFH4000-01 | English | 3 | |
| INGPA-LFH4000-03 | Team Management | | |
| INGPA-LFH4000-05 | Budget Management | | |
| Minor Unit | | | |
| MIN | Minor ** | 2 | |
| TOTAL ECTS | | 13 | |

* Innovative project centered on a multidisciplinary subject. The PPE meets a dual challenge: the ability to build a genuine team project and to ensure its technical implementation.

** If you do not have a B2 level in French your minor will be *French as a foreign language* courses.

If you have a B2 level in French, you will be able to choose between 7 Minors:

- Gestion d'une organisation et management par projets
- Recherche et développement
- Marketing
- Négociation commerciale
- Entreprenariat
- Création numérique
- Projet personnel

Spring Semester

| Course code | Course Title | ECTS Crédits |
|--|---|-----------------|
| Project Unit * | | |
| INGPA-PRJ4000-10-MENT | Pluridisciplinary Team Project - Grade Mentor | 8 |
| INGPA-PRJ4000-10-SOUT | Pluridisciplinary Team Project - Defence | |
| INGPA-PRJ4000-10-VALO | Pluridisciplinary Team Project - Valorisation | |
| LANGUAGES AND HUMAN SCIENCES UNIT | | |
| INGPA-LFH4000-02 | English | 3 |
| INGPA-LFH4000-08 | Individual Relationship Management | |
| INGPA-LFH4000-11 | Corporate Management | |
| Minor Unit | | |
| MIN | Minor ** | 2 |
| TOTAL ECTS | | 13 |

* Innovative project centered on a multidisciplinary subject. The PPE meets a dual challenge: the ability to build a genuine team project and to ensure its technical implementation.

** If you do not have a B2 level in French your minor will be the course: *French as a foreign language*.

If you have a B2 level in French, you will be able to choose between 7 Minors:

- Gestion d'une organisation et management par projets
- Recherche et développement
- Marketing
- International
- Entreprenariat
- Création numérique
- Projet personnel

Information Systems

Managing of information is a genuine challenge for companies. It is necessary in order to adapt to a rapidly changing global market and to respond to competition. It also gives an opportunity to create value based on new technology.

The subject matter in this major teaches engineers to analyze, design, build and manage information systems to meet the strategy- needs of businesses while leveraging the latest technologies and methods. The use of data for decision making, modeling and constructing information systems, services and web architectures, security, networks, and artificial intelligence are some of the subjects being taught. The opportunities are numerous in the specialized area of information technology (software, it services, service providers and access), in publi- service and generally any industry requiring management information or a presence on world markets.

Learning Outcomes

- Ability to design and implement information systems to meet business needs using the most appropriate technologies in architecture, decision, intelligence and security.
- Ability to solve real problems of both businesses and society using information technology.
- Ability to help companies profit from new icts and to develop the business function.

Recommended:

- Basic knowledge in computer networks and operating systems
- Basic knowledge of Matlab and Python.

Head of Information Systems specialization:

Jean-Michel Busca : jeanmichel.busca@ece.fr

Autumn Semester

| Course code | Course Title | ECTS Crédits |
|----------------------------|---------------------|-----------------|
| Specialization Unit | | |
| INGPA-INF4000-21 | Web Technologies | 3.5 |
| INGPA-INF4000-13 | Advanced Databases | 3.5 |
| INGPA-INF4000-16 | Operating Systems | 3.5 |
| INGPA-NET4000-11 | Computer Networks 1 | 2 |
| INGPA-NET4000-39 | Infrastructure IT | 1.5 |
| INGPA-INF4000-25 | DevOps with SRE | 3 |
| TOTAL ECTS | | 17 |

Spring Semester

| Course code | Course Title | ECTS Crédits |
|----------------------------|-----------------------------------|-----------------|
| Specialization Unit | | |
| INGPA-INF4000-36 | Machine Learning 1 | 3.5 |
| INGPA-INF4000-32 | Information Systems Security I | 3.5 |
| INGPA-NET4000-12 | Computer Networks Security | 3 |
| INGPA-NET4000-06 | Management of Information Systems | 1 |
| Option 1* | | |
| INGPA-INF4000-12 | Microsoft C# | 3 |
| INGPA-INF4000-18 | Advanced Java | 3 |
| Option 2* | | |
| INGPA-INF4000-19 | Mobile Programming | 3 |
| INGPA-INF4000-38 | Mathematics for Data Scientist | 3 |
| TOTAL ECTS | | 17 |

* You have to choose between one of the two subjects for each option. For each class in the options, you will have 3 ECTS.

Embedded Systems

Little known to the general public, embedded systems, however, play a very important role in our lives. Just take a look around to understand their importance: cellphones, pass navigo (transportation), credit cards, cars, tgv, airplanes, alarms, air conditioning, gps, and multimedia consoles.

An embedded system can be defined as a computer (software and hardware) embedded in a constrained environment (low power consumption, reduced memory capacity, real-time, security, and robust). Its ability to communicate also allows it to exchange acquisition and control information at a distance. In a highly competitive global context, embedded systems are a key differentiator for a large number of sectors: energy, transportation, defense, aerospace, healthcare, media, telecoms, smart cards, production, logistics, and consumer electronics. At the heart of social issues, embedded systems contribute fully to stimulating innovation in the areas of intelligent transportation, personal assistance, sustainable mobility, homecare, and the controlling consumption.

What we can learn from most embedded systems contributes fully to stimulating innovation in the areas of intelligent transportation, personal assistance, sustainable mobility, homecare, and the controlling consumption.

Learning Outcomes

Ability to design and implement electronic- systems in different settings (automobiles, other land transport, aviation, and mobile communication devices) using all the possibilities offered by real-time computing and telecommunications.

Head of Embedded Systems specialization:

Olivier Chesnais: olivier.chesnais@ece.fr

Autumn Semester

| Course code | Course Title | ECTS Crédits |
|----------------------------|--------------------------------|-----------------|
| Specialization Unit | | |
| INGPA-PRJ4000-02 | Technical Project | 3 |
| INGPA-INF4000-02 | Advanced programming in C | 3 |
| INGPA-ELE4000-06 | Microcontrollers | 3 |
| INGPA-ELE4000-11 | Digital Signal Processors | 3 |
| INGPA-INF4000-08 | Embedded Linux | 3 |
| INGPA-INF4000-35 | Analysis and design with SCADE | 2 |
| TOTAL ECTS | | 17 |

Spring Semester

| Course code | Course Title | ECTS Crédits |
|----------------------------|----------------------------------|-----------------|
| Specialization Unit | | |
| INGPA-INF4000-26 | Drivers Linux | 2 |
| INGPA-INF4000-11 | Real Time | 3 |
| INGPA-ELE4000-12 | Digital circuit design FPGA-VHDL | 3 |
| INGPA-ELE4000-03 | Sensors & Interface | 3 |
| INGPA-NET4000-03 | Industrial local networks | 3 |
| INGPA-NET4000-04 | Computer networks | 3 |
| TOTAL ECTS | | 17 |

New Energies and Environment

It covers all of the high-tech professions involved in energy production and distribution, as well as consumption management.

It builds on a body of knowledge indispensable for any energy engineer ranging from thermodynamics to material science, from fossil fuel to renewable energy, and from nuclear generation to Smart Grid technologies. It also covers embedded energy sources such as batteries and fuel, which is the key to miniaturization, mobility and the transportation of the future. Considerable attention is devoted to buildings, which represent 40% of total energy consumption. Thermal materials are studied to understand the technologies of insulation, photonics, and solar panels to control the production of photovoltaic energy. Science and high-tech come together to design buildings with low energy consumption, create housing for the future and steer its main energy functions.

Beyond energy production, this major explores the professions directly related to the protection of the environment and sustainable development:

- ☒ The control and management of energy infrastructures, in order to optimize the use of fossil fuels and renewable energy sources.
- ☒ Smart metering using sensor networks, real-time information systems and the telecommunications that are associated with them.
- ☒ Energy automation functions of private homes and corporations, based on the knowledge of materials and the operation of solar panels.
- ☒ Expertise in fuels and batteries is fundamental to mass production of energy efficient hybrid vehicles and mainstreaming embedded systems.

Learning Outcomes

Ability to design and implement renewable energy production systems, intelligent systems that control energy infrastructure, consumption management and energy storage using all high-tech possibilities of control, sensor networks and information systems

Head of Energy and Environment specialization:

Dr. Philippe Haik: philippe.haik@ece.fr

Autumn Semester

| Course code | Course Title | ECTS Crédits |
|----------------------------|--|-----------------|
| Specialization Unit | | |
| INGPA-ENE4000-02 | Applied Chemistry | 2 |
| INGPA-ENE4000-03 | Physics for Energy 1 | 2 |
| INGPA-ENE4000-16 | Energy Practical Work (UPMC) 1 | 1 |
| INGPA-ENE4000-06 | Fossil Fuel : Combustion | 2 |
| INGPA-PRJ4000-11 | Introduction to Embedded Systems (Project) | 2 |
| INGPA-ENE4000-05 | Energy Markets | 2 |
| INGPA-ENE4000-11 | Eronomics & User Experience | 1.5 |
| INGPA-ENE4000-07 | Renewable Energy 1 | 3 |
| INGPA-ENE4000-14 | Oil & Gas Industry | 1.5 |
| TOTAL ECTS | | 17 |

Spring Semester

| Course code | Course Title | ECTS Crédits |
|----------------------------|---|-----------------|
| Specialization Unit | | |
| INGPA-ENE4000-09 | Electrotechnics & Power Electronics | 1.5 |
| INGPA-ENE4000-23 | Physics for Energy 2 | 1 |
| INGPA-INF4000-04 | Web Project for Energy | 1.5 |
| INGPA-ENE4000-24 | Energy Practical Work (UPMC) 2 | 0.5 |
| INGPA-ENE4000-08 | Renewable Energy 2 | 2 |
| INGPA-ENE4000-13 | Nuclear Energy | 1.5 |
| INGPA-ENE4000-18 | Introduction to Energy Conversion & Storage | 1.5 |
| INGPA-MAT4000-01 | Blockchain for Energy | 2 |
| INGPA-ENE4000-21 | Introduction to Niagara | 2 |
| INGPA-ENE4000-22 | Sustainable Development | 2 |
| INGPA-ENE4000-01 | Smart grid, Smart city, Smart everywhere : besoins et enjeux | 1.5 |
| TOTAL ECTS | | 17 |

Master courses ING 5

Big Data & Analytics

Head of Big Data & Analytics specialization:

Jean-Michel Busca : jeanmichel.busca@ece.fr

Autumn Semester

Spring Semester is dedicated to an internship.

| Course code | Course Title | ECTS Crédits |
|-------------------------------------|---------------------------------------|-----------------|
| Elective course Unit* | | |
| You must choose one elective course | Aeronautical | 5 |
| | Scientific calculation | |
| | Data Scientist | |
| | Course design | |
| | Cloud architecting | |
| | Quantum technologies and computing | |
| | nanotechnology | |
| | Personal project | |
| | Robotics | |
| | Electric and hybrid vehicles | |
| | Buisness process automation | |
| Project Unit** | | |
| INGPA-PRJ5000-00 | Final Year Project | 6 |
| French as a Foreign Language Unit | | |
| INGPA-LFH5000-10 | French as a Foreign Language | 2 |
| Language and Human Sciences Unit* | | |
| INGPA-LFH5000-05 | Workplace Health, Safety and Security | 2 |
| INGPA-LFH5000-01 | Change Management | |
| Specialization Unit | | |
| INGPA-INF5000-01 | Buisness Intelligence | 2,5 |
| INGPA-INF5000-46 | Real Time Big Data Search & Analytics | 2 |
| INGPA-INF5000-19 | Machine Learning 2 | 2 |
| INGPA-INF5000-20 | Deep Learning | 2,5 |
| INGPA-INF5000-03 | Big Data Ecosystem | 2 |
| INGPA-INF5000-13 | Big Data Analysis with Spark | 2 |
| INGPA-INF5000-06 | Big Data Analytics | 3 |
| INGPA-INF5000-04 | Ethics of Artificial Intelligence | 1 |
| TOTAL ECTS | | 32 |

* Courses taught in French

** Project runs from September to the beginning of February.