



ESME School of Engineering

# Undergraduate Program

Courses available for exchange students – Undergraduate Level

| Paris   | Lille   | Lyon   |
|---|---|--|
|  |  |  |
| Engineering Sciences<br>Undergraduate<br>program                                    | Engineering Sciences<br>Undergraduate<br>program                                    | Engineering Sciences<br>Undergraduate<br>program                                     |

Please note that all classes below are available in the 3 campuses



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Paris-Center Campus

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## Undergraduate Program – Creative Engineering Workshops – Fall Semester (September – January)

| SEMESTER   | TEACHING UNIT                 | COURSE DESCRIPTION  | AIMS  | HOURS           | ECTS CREDITS |
|------------|-------------------------------|---|---|-----------------|--------------|
| 1, 3       | Alternative Controllers       | Design, test and fabricate new ways to play your favourite games! Using standout projects of the AltCtrl movement for inspiration, student teams will learn and use a wide range of digital design and fabrication skills and tools, as well as electronic sensors, actuators and control systems. Their goal: make a completely new way to play an existing game, or even design and make their own! You will learn to think outside the box, break the box down, reassemble it, and connect it to control modules for an innovative play experience.                      | The final boss battle is a showcase, where other students and industry professionals come and play with your device. Players need to have fun with your prototype, and it needs to survive!   | 25 to 30<br>hrs | 10           |
| 1, 2, 3, 4 | Interactive Expérience Design | Design and make an interactive project, based around wireless IoT technology. This workshop is designed to be accessible to first-time makers. The only hard constraint for your project is ambition. Want to create a laser and sensor-based mini escape game? An interactive story machine? An automated drink mixer? It's up to you to choose your focus. Electronics, sensor arrays, digital design and/or fabrication, biodesign, among many others, of course. We help you assemble - and provide you with - a customised learning program to suit your team's needs. | We encourage the use of advanced electronics, such as Raspberry Pi , printed circuit board and wireless open source solutions to make remotely controlled devices. The final showcase will involve and external visitors to impress with the results of your creative engineering work! | 25 to 30<br>hrs | 10           |



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## Undergraduate Program – Creative Engineering Workshops – Spring Semester (February - June)

| SEMESTER | TEACHING UNIT   | COURSE DESCRIPTION  | AIMS  | HOURS           | ECTS CREDITS |
|----------|---|---|---|-----------------|--------------|
| 2, 4     | Design for Disability<br><br>(With the LPI – Learning Planet Institute) | ESME partners with the <a href="#">Learning Planet Institute</a> to offer this hands-on workshop in English. In groups, students try to create and / or improve everyday technological solutions in order to reach the sustainable development goals set by the UN, specifically those concerning health & disabilities.  | Each group has a budget of 300€ to purchase items pertaining to the project they are working on. Students use 3D printers, laser cutters, Arduino boards and other tools to conceptualize, experiment and carry their projects out.                                     | 25 to 30<br>hrs | 10           |
| 2, 4     | Gears for Breakfast   | Put your knowledge of mechanical motion into practice by designing and fabricating an original mobile assembly. Student teams will experiment with a variety of motion control and execution systems, and combine them into an original, never-before-seen complex mechanical creation. The wide range of possible project directions includes wearable mechanical masks, steampunk vehicles, automatic musical instruments, Rube Goldberg machines, soft robotics, and wind-driven robots, to name but a few. It's up to you to define how your kinetic creation will mix movement and blow our minds! | Student teams will put into practice and combine physics principles such as torque, force, kinetic energy, and motion conversion, with digital design and fabrication, and both powered (eg. electric motors) and unpowered (eg. hydraulics) drive and control systems. | 25 to 30<br>hrs | 10           |



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|            |  |   |   |                 |    |
|------------|--|---|---|-----------------|----|
| 1, 2, 3, 4 | <p>Interactive<br/>Expérience<br/>Design</p> | <p>Design and make an interactive project, based around wireless IoT technology. This workshop is the culmination of the previous years', yet is still designed to be accessible to first-time makers. The only hard constraint for your project is ambition. Want to create a laser and sensor-based mini escape game? An interactive story machine? An automated drink mixer? It's up to you to choose your focus. Electronics, sensor arrays, digital design and/or fabrication, biodesign, among many others, of course. We help you assemble - and provide you with - a customised learning program to suit your team's needs.</p> | <p>We encourage the use of more advanced electronics, such as Raspberry Pi and wireless open source solutions to make devices that can be controlled remotely. You'll even have the opportunity to design and make your own printed circuit board. As with the other workshops, the final showcase will involve other students and external visitors to impress with the results of your creative engineering work!</p> | 25 to 30<br>hrs | 10 |
|------------|--|---|---|-----------------|----|



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## Undergraduate Program – Year 1 – Fall Semester (September – January)

| SEMESTER | TEACHING UNIT                        | COURSE                             | HOURS    | ECTS CREDITS |
|----------|--------------------------------------|------------------------------------|----------|--------------|
| 1        | UE 1 - Fund. Sciences for Engineers  | Fundamental Math                   | 27 hrs   | 6            |
| 1        | UE 1 - Fund. Sciences for Engineers  | Applied Math                       | 27 hrs   | 6            |
| 1        | UE 1 - Fund. Sciences for Engineers  | Electrokinetics                    | 47 hrs   | 10           |
| 1        | UE 2 - Sciences for Energy & Climate | Technical Systems                  | 26 hrs   | 5            |
| 1        | UE 2 - Sciences for Energy & Climate | Wave Motion et Geometrical Optics  | 30 hrs   | 6            |
| 1        | UE 2 - Sciences for Energy & Climate | Living Systems                     | 12 hrs   | 2            |
| 1        | UE 2 - Sciences for Energy & Climate | Citizens & Sciences                | 10,5 hrs | 2            |
| 1        | UE 3: Languages & Tech for Engineers | Python Language                    | 18 hrs   | 3            |
| 1        | UE 3: Languages & Tech for Engineers | French as a Foreign Language       | 10,5 hrs | 2            |
| 1        | UE 3: Languages & Tech for Engineers | English Language                   | 27 hrs   | 5            |
| 1        | UE 3: Languages & Tech for Engineers | Additional Language                | 18 hrs   | 3            |
| 1        | UE 4: Perso. & Pro. Projects         | Introduction to Business Economics | 15 hrs   | 3            |



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## Undergraduate Program – Year 1 – Spring Semester (February – June)

| SEMESTER | TEACHING UNIT                        | COURSE                                | HOURS    | ECTS CREDITS |
|----------|--------------------------------------|---------------------------------------|----------|--------------|
| 2        | UE 1 - Fund. Sciences for Engineers  | Fundamental Math                      | 39 hrs   | 8            |
| 2        | UE 1 - Fund. Sciences for Engineers  | Applied Math                          | 39 hrs   | 8            |
| 2        | UE 1 - Fund. Sciences for Engineers  | Electromagnetism                      | 39 hrs   | 8            |
| 2        | UE 2 - Sciences for Energy & Climate | Technical Systems                     | 26 hrs   | 5            |
| 2        | UE 2 - Sciences for Energy & Climate | Thermal Machines & Thermal Transfers  | 36 hrs   | 6            |
| 2        | UE 2 - Sciences for Energy & Climate | Living Systems                        | 12 hrs   | 2            |
| 2        | UE 2 - Sciences for Energy & Climate | Citizens & Sciences                   | 10,5 hrs | 2            |
| 2        | UE 2 - Sciences for Energy & Climate | Microcontroller Programming           | 12 hrs   | 2            |
| 2        | UE 3: Languages & Tech for Engineers | Advanced Algorithmics                 | 24 hrs   | 5            |
| 2        | UE 3: Languages & Tech for Engineers | English Language                      | 45 hrs   | 10           |
| 2        | UE 3: Languages & Tech for Engineers | Additional Language / French Language | 20 hrs   | 4            |
| 2        | UE 3: Languages & Tech for Engineers | Introduction to Business Economics 1  | 15 hrs   | 3            |
| 2        | UE 4: Perso. & Pro. Projects         | Introduction to Business Economics 2  | 21 hrs   | 4            |



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## Undergraduate Program – Year 2 – Fall Semester (September – January)

| SEMESTER | TEACHING UNIT                        | COURSE                               | HOURS    | ECTS CREDITS |
|----------|--------------------------------------|--------------------------------------|----------|--------------|
| 3        | UE 1 - Fund. Sciences for Engineers  | Fundamental Math                     | 39 hrs   | 8            |
| 3        | UE 1 - Fund. Sciences for Engineers  | Applied Math                         | 39 hrs   | 8            |
| 3        | UE 1 - Fund. Sciences for Engineers  | Introduction to Digital Analysis     | 24 hrs   | 5            |
| 3        | UE 1 - Fund. Sciences for Engineers  | Signals & Systems                    | 47 hrs   | 10           |
| 3        | UE 2 - Sciences for Energy & Climate | Technical Systems                    | 26 hrs   | 5            |
| 3        | UE 2 - Sciences for Energy & Climate | Fluid Mechanics et acoustic waves    | 36 hrs   | 7            |
| 3        | UE 2 - Sciences for Energy & Climate | Living Systems                       | 12 hrs   | 2            |
| 3        | UE 2 - Sciences for Energy & Climate | Project Management: SMART Objectives | 10,5 hrs | 2            |
| 3        | UE 3: Languages & Tech for Engineers | Analog Electronics                   | 24 hrs   | 5            |
| 3        | UE 3: Languages & Tech for Engineers | English Language                     | 18 hrs   | 3            |
| 3        | UE 3: Languages & Tech for Engineers | Additional Language                  | 20 hrs   | 4            |
| 3        | UE 4: Perso. & Pro. Projects         | Personal Development                 | 10,5 hrs | 2            |
| 3        | UE 4: Perso. & Pro. Projects         | Business Strategy                    | 18 hrs   | 3            |





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## Undergraduate Program – Year 2 – Spring Semester (February – June)

| SEMESTER | TEACHING UNIT                        | COURSE                | HOURS    | ECTS CREDITS |
|----------|--------------------------------------|-----------------------|----------|--------------|
| 4        | UE 1 - Fund. Sciences for Engineers  | Fundamental Math      | 36 hrs   | 7            |
| 4        | UE 1 - Fund. Sciences for Engineers  | Applied Math          | 36 hrs   | 7            |
| 4        | UE 1 - Fund. Sciences for Engineers  | Electromagnetism      | 36 hrs   | 7            |
| 4        | UE 2 - Sciences for Energy & Climate | Technical Systems     | 26 hrs   | 5            |
| 4        | UE 2 - Sciences for Energy & Climate | Electromagnetic Waves | 25.5 hrs | 5            |
| 4        | UE 2 - Sciences for Energy & Climate | Living Systems        | 12 hrs   | 2            |
| 4        | UE 2 - Sciences for Energy & Climate | HMI Applications      | 10 hrs   | 2            |
| 4        | UE 3: Languages & Tech for Engineers | Analog Electronics    | 24 hrs   | 5            |
| 4        | UE 3: Languages & Tech for Engineers | Advanced Algorithmics | 24 hrs   | 5            |
| 4        | UE 3: Languages & Tech for Engineers | English Language      | 63 hrs   | 10           |
| 4        | UE 3: Languages & Tech for Engineers | Additional Language   | 20 hrs   | 4            |
| 4        | UE 4: Perso. & Pro. Projects         | Personal Development  | 10,5 hrs | 2            |
| 4        | UE 4: Perso. & Pro. Projects         | Business Strategy     | 18 hrs   | 3            |



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### Undergraduate Program – Year 3 – Fall Semester (September – January)

| SEMESTER | TEACHING UNIT                       | COURSE                       | HOURS  | ECTS CREDITS |
|----------|-------------------------------------|------------------------------|--------|--------------|
| 5        | UE 1 – Mathematic and Numeric Tools | Statistics and Probabilities | 24 hrs | 5            |
| 5        | UE 1 – Mathematic and Numeric Tools | Signal Processing            | 48 hrs | 10           |
| 5        | UE 1 – Mathematic and Numeric Tools | Linear Systems               | 28 hrs | 5            |
| 5        | UE 1 – Mathematic and Numeric Tools | Java                         | 36 hrs | 7            |
| 5        | UE 2 – Material Environment         | Energy                       | 32 hrs | 6            |
| 5        | UE 2 – Material Environment         | Electronics                  | 46 hrs | 10           |
| 5        | UE 2 – Material Environment         | UNIX                         | 24 hrs | 5            |
| 5        | UE 2 – Material Environment         | Software Engineering         | 24 hrs | 5            |
| 5        | UE 3: Soft Skills                   | Project Dynamics             | 24 hrs | 5            |
| 5        | UE 3: Soft Skills                   | Business Models              | 22 hrs | 5            |
| 5        | UE 3: Soft Skills                   | English Language             | 48 hrs | 10           |
| 5        | UE 3: Soft Skills                   | Additional Language          | 12 hrs | 2            |



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## Undergraduate Program – Year 3 – Spring Semester (February – June)

| SEMESTER | TEACHING UNIT                       | COURSE                                 | HOURS  | ECTS CREDITS |
|----------|-------------------------------------|--|--------|--------------|
| 6        | UE 1 – Mathematic and Numeric Tools | Optimization                           | 24 hrs | 5            |
| 6        | UE 1 – Mathematic and Numeric Tools | Statistical Signal Processing          | 32 hrs | 6            |
| 6        | UE 1 – Mathematic and Numeric Tools | Machine Learning                       | 24 hrs | 5            |
| 6        | UE 1 – Mathematic and Numeric Tools | Linear Automatic                       | 28 hrs | 6            |
| 6        | UE 1 – Mathematic and Numeric Tools | Web programing                         | 24 hrs | 5            |
| 6        | UE 2 – Material Environment         | Electric Machines                      | 32 hrs | 6            |
| 6        | UE 2 – Material Environment         | Microsystems                           | 28 hrs | 6            |
| 6        | UE 2 – Material Environment         | Network Overview                       | 24 hrs | 5            |
| 6        | UE 2 – Material Environment         | Databases                              | 24 hrs | 5            |
| 6        | UE 3: Soft Skills                   | Personal Development and Corp. Culture | 24 hrs | 5            |
| 6        | UE 3: Soft Skills                   | Personal and Professional Project      | 24 hrs | 5            |
| 6        | UE 3: Soft Skills                   | Lean Management                        | 12 hrs | 2            |
| 6        | UE 3: Soft Skills                   | Sustainable Development                | 12 hrs | 2            |
| 6        | UE 3: Soft Skills                   | English Language                       | 24 hrs | 5            |