



# ÉCOLE CENTRALE LYON

## FACT SHEET 2022-2023

### ∞ GENERAL INFORMATION ∞

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<b>∞ EXCHANGE APPLICATION ∞</b>	
<b>Academic calendar</b>	<p><b>Autumn semester:</b> August 29, 2022 – January 27, 2023 *</p> <p><b>Spring semester:</b> January 30, 2023 – June 30, 2023*</p> <p><i>* dates to be confirmed</i></p>
<b>Arrival Day</b>	<p><b>August 29, 2022*:</b> Double Degree + “3<sup>rd</sup> Year” exchange</p> <p><b>January 30, 2023*:</b> “Semester 8” exchange</p> <p><i>* dates to be confirmed</i></p>
<b>Application Procedure</b>	<p>Complete the online application form (MobilityOnline). Documents to be enclosed with the application are:</p> <ul style="list-style-type: none"> <li>- Resume (CV)</li> <li>- Official nomination from your university</li> <li>- Photo ID</li> <li>- Transcripts (since you entered higher education)</li> <li>- Proof of French language competency</li> <li>- Proof of English language competency</li> <li>- Scientific reference letters (one at least)</li> <li>- Copy of the passport</li> </ul> <p>Mid-May, application forms will be examined by the selection committee. Double Degree students are not concerned when they have already been selected in their home countries by the jury of the Group of Ecoles Centrales (Brazil, Chili, China, Germany, Mexico, Japan). However, these students must still complete their online application form via MobilityOnline.</p> <p>In June, applicants will receive the outcome of the commission.</p> <p><b>Prospective exchange students applying for the full year exchange or for an academic semester exchange must either have an academic Bachelor degree or they must have at least 180 ECTS credits prior to their exchange application. Exceptions to this rule must be dealt with prior to applications between the home and host institutions.</b></p>
<b>Application deadlines</b>	<p><b>Between March 14 and April 29, 2022*:</b> double degree program, “3<sup>rd</sup> year”</p> <p><b>October 26, 2022* :</b> “Semester 8” exchange</p> <p><i>* dates to be confirmed</i></p> <p>Application forms and further information: <a href="http://www.ec-lyon.fr/">http://www.ec-lyon.fr/</a>, select « International »</p>
<b>∞ ACADEMIC INFORMATION ∞</b>	
<b>Language of instruction</b>	<p><b>French</b> – a few English courses are available (please consult the curriculum). A good knowledge and skills in French language are required to successfully pursue the studies at ECL (at least a “B1 level” of the Common European Framework of Reference for Languages [CEFRL]).</p>
<b>French language courses</b>	<p>French language courses are included in all the study programmes. Double degree students must pass a minimum of “B2 level” by the end of their stay at ECL.</p>
<b>English language</b>	<p>To get the French “Diplôme d’Ingénieur”, every student must reach a minimum of:</p> <ul style="list-style-type: none"> <li>- 590 for the TOEFL (ITP and PBT) exam</li> <li>- 96 for the TOEFL IBT exam</li> <li>- 825 for the TOEIC Listening and reading exam</li> <li>- 7 for the IELTS exam</li> <li>- 173 for the Cambridge certifications exam</li> <li>- 120 for the Duolingo English Test</li> </ul> <p>➔ Every double degree student must have a minimum background in English: no beginners’ English courses are available in the study programmes.</p>

## Grading system

ECTS (European Credit Transfer System)  
Workload of a full-time student:

- 30 ECTS per semester
- 60 ECTS per academic year

Depending on the course, 1 ECTS corresponds to about 30 hours of work; half of them spent in-class.  
The scale is from A  $\geq 14$  excellent to F  $< 10$  Fail.  
The grades are from 0 to 20, 10 being the pass mark. The lowest passing grade is 8, if the Jury validates it.  
In Ecole Centrale de Lyon, grade 20 is extremely rare. Grades 15-20 rare. 14 and up are excellent.

Our institutional grading is explained below:

Evaluation	Grade	Percentage of successful students Normally achieving the grade	Definition
A	$\geq 14$	10	Excellent
B	$> 12$ and $< 14$	30	Very Good
C	$> 11$ and $< 12$	30	Good
D	$> 10$ and $< 11$	30	Satisfactory
J			Validated by the Jury
F	$< 10$		Fail

## General Engineering training

General syllabus at ECL is composed of:

- **A compulsory core syllabus** of 3 semesters (**common core**): Mathematics, Electrical Energy and Systems Control, Computer Science, Information Science and Engineering, Solids Mechanics and Structures, Mechanical Engineering, Fluids and Energy, Materials Engineering, Physics and Chemistry of Matter, Human and social Sciences, Languages, professional Unit (ex. study Projects, Sports) + **1 month internship in a company**, working as a blue-collar worker.

After completing the 3 semester core programme, students create their own optional course, depending on their preferences and their career plan:

- **1 semester of transition (semester 8)**: for starting to specialize (elective courses) + **3 months internship in a lab or in a company**, working as an engineer.

- **2 semesters to focus on two areas - sectorial and functional (3rd year)**: 7 “Options” (sectorial electives) and 6 “Métiers” (functional electives), completed by a **5 to 6 month final year internship in a lab or in a company** achieving a project as an engineer. This internship is concluded by a written thesis and an oral defence.

## Incoming students

Depending on the Agreement between ECL and the home institution, students will be allowed to follow:

- Semester 8
- 3<sup>rd</sup> year (Semester 9 and 10) [+ possibly a Master Degree]
- Double-Degree (1<sup>st</sup> and 2<sup>nd</sup> year or 2<sup>nd</sup> and 3<sup>rd</sup> year or hybride)
- Certificate in Research Training (1 year in an ECL research lab)
- Accelerated Engineering Degree Program

Further information: <http://www.ec-lyon.fr/>, select « **International** »

## STUDENTS' LIFE

## Accommodation

The 10 hectares residential area on the campus includes 2 dorms:

- The residence **Paul Comparat**, which is run by the School itself with rooms (13 m<sup>2</sup>) include a bathroom and a shared-kitchen for 16 rooms. Approximate rent per month: 342€\*
- The residence **ADOMA**, (private residence) with studios include a bathroom and a kitchenette (18 m<sup>2</sup>). Approximate rent per month: 473,93€\*

Further information: <http://www.ec-lyon.fr/>, select « **Campus/Hébergement** »

\* *Price may vary*

We try to guarantee a room for all incoming student (coming for 1 year or more) who wish to live on the campus.

	<p>We can unfortunately not guarantee the same for students coming for only 1 semester.</p> <p>The application form for the housing will be sent via MobilityOnline by the International Office after the student admission.</p> <p><b>Housing assistance for students</b>  In France, students of all nationalities may apply for government housing assistance. Assistance amounts are computed case by case, based on the rental amount. Applications for assistance must be completed on the website of the family assistance fund (CAF, Caisse d'allocation familiale) after the arrival at ECL, within 3 months of taking possession of the room or studio.</p>
<b>Canteen</b>	<p>The canteen lies halfway between the teaching and research buildings and the dorms, in a building which also houses the association premises, the students' centre, and the cafeteria.</p> <p>Meal cost per student: 3,25 €*  * <i>Price may vary</i></p> <p>Opening hours are:  - Monday – Friday, lunch: 11:30 to 13:30  - Monday – Wednesday, dinner: 18:45 to 20:15</p>
<b>Visa / Residence permit</b>	<p>Students from countries outside Europe need to apply for a visa/residence permit for studies before entering France. Even if they live in EU countries, they must apply for a student visa at the French Consulate/Embassy in the country in which they reside.</p> <p>There are several kinds of visa. With one exception, Algerian nationals, the VLS-TS visa applies to all international students wishing to enrol in a French institution of higher education. The VLS-TS visa is valid for 1 year.</p> <p>After their arrival in France, the International Office helps the exchange students with the visa formalities relating to their stay in France.</p> <p>Information and application form may be obtained from the French Embassy or consulate in the home country.</p> <p>For further information:</p> <ul style="list-style-type: none"> <li>➤ Campus France Agency, the national agency for the promotion of French higher education abroad: <a href="http://www.campusfrance.org/en">http://www.campusfrance.org/en</a></li> <li>➤ Rhône Prefecture: <a href="http://www.rhone.gouv.fr">http://www.rhone.gouv.fr</a></li> </ul>
<b>Health Insurance</b>	<p>To be considered as a regular student, it is required to have a complete insurance coverage for the entire stay in France.</p> <p>- <b>Students from EU/EEA member countries</b> should bring the European Insurance card or a certificate of private insurance providing full coverage for medical risks without restrictions related to cost. “The EU-card” does not mean that supplementary insurance is not necessary.</p> <p>- <b>Non European students</b> must be enrolled at the <b>Social Security system</b>. Once the students arrive and are registered at ECL, they have to complete the free online procedure (<a href="http://etudiant-etranger.ameli.fr">etudiant-etranger.ameli.fr</a>). They also have the possibility to subscribe to a supplementary health insurance.</p> <p>It is mandatory to get a private health insurance before the registration and arrival at ECL.</p>
<b>The third party liability insurance</b>	<p>It is mandatory for every student enrolled at ECL to take out a <b>third party liability insurance</b> in order to be covered for damage they may unintentionally cause to others or for material they may damage during their stay at ECL.</p>

## Academic Exchange possibilities with the Ecole Centrale de Lyon

### 1. The Engineering Science programme at the Ecole Centrale de Lyon

The basic teaching programme at the ECL is a three year taught degree in Engineering Science. Students usually spend two years post-baccalaureat (post-18) in *Classes Préparatoires*, offered by selected *lycées*, preparing for the competitive entrance exam for the major engineering schools, and during this time they study essentially maths and physics. Once admitted to the ECL, students begin with 18 months of the common core curriculum, in which they study all the main engineering science disciplines, and then, for the remaining 18 months, they can specialise, to some extent.

Teaching at the ECL is organised in semesters; to take account of the preceding two years of *Classes Préparatoires*, the two semesters of the first year are denoted S5 and S6, those of our second year S7 and S8, and those of the final year S9 and S10. The academic year (S5, S7, S9) starts at the beginning of September, and the semesters S6 and S8 start at the beginning of February. S10, the second semester of the final year, starts later, at the beginning of April.

There are therefore 3 main blocks of courses in the Engineering Science programme:

- The core curriculum – Semesters S5, S6 and S7 (see Appendix A)
- A semester of optional courses – Semester S8 (see Appendix B)
- A year of specialization – Semesters S9 and S10 (see Appendix C)

Each semester is worth 30 ECTS.

As can be seen in Appendix A, subject teaching is done in a single unit, so there is no imposed order in which the courses are taken. Consequently, the teaching programme does not fully comply with the European LMD (3-5-8) scheme, and is essentially a 2-4-5-8 structure, in which the first two years at the Ecole Centrale are equivalent to the final year of a Bachelor degree *and* the first year of a 2-year Master's degree, but mixed in together. The final year (S9 and S10) is then equivalent to the final year of a 2-year Master's programme, and the Engineering degree is considered equivalent to a Masters degree.

### 2. Masters programmes at the Ecole Centrale de Lyon

In France the engineering degree is considered equivalent to a Masters degree, but it is not the same as a Masters degree; the engineering degree in France confers certain rights and advantages (higher salaries, posts that are reserved for graduates with an engineering degree, sometimes even from a particular Grande Ecole....) whilst, in some situations, a doctoral school might require that all candidates hold a Masters degree. So the Ecole Centrale also offers a range of Masters degrees, including three international programmes that are taught entirely in English. The full list is provided in Appendix D.

Masters programmes in France usually last 2 years; most of the Masters programmes at the Ecole Centrale are offered in collaboration with other higher educational establishments in Lyon and St Etienne, and at the moment the Ecole Centrale only offers courses for the second year of these Programmes (M2). But this is changing; the Ecole Centrale is currently applying for accreditation for a further 9 Masters programmes to be taught entirely in English, and we will also be offering entry at M1 level for several of our Masters programmes.

Some final year engineering students at the Ecole Centrale also take, in parallel, the M2 courses from one of the Masters programmes, and obtain – if successful – the corresponding Masters degree as well as the engineering degree. This is possible because the vast majority of the M2 courses are shared with the final year Engineering programme at the ECL

### 3. Exchange programmes for incoming students

#### 3.1 The S8 semester (30 ECTS)

The S8 semester runs from the beginning of February until the middle of July. Students take 6 courses from a choice of about 60 (arranged, for timetabling purposes in 6 blocks). The subjects offered in S8 change a little every year, but the programme for 2020-21 is provided in Appendix B. About a third of the courses are offered in English, and this proportion is slowly increasing every year. We would consider the academic level of these courses to be equivalent to M1.

The taught courses finish at the end of April, and are worth 12ECTS; students obtain the remaining 18ECTS from language courses and an extended, full-time research project in one of our laboratories, from May until the middle of July. The research project can be conducted entirely in English.

We aim to offer incoming S8 students a room on campus, but we cannot always guarantee this.

#### 3.2 The Diplôme d'Études Supérieures de l'Ecole Centrale de Lyon (DESECL) (60 ECTS)

The DESECL is a *Diplôme d'établissement* awarded to students who have successfully completed the entire final year programme. Students taking this programme follow all the taught courses in S9:

- A Métier
- An Option
- 2 Modules Ouverts Métier
- 6 Modules Ouverts Disciplinaires
- 3 Modules Ouverts Sectoriels

and the extended internship in S10, which can be done either in one the laboratories of the Ecole Centrale, or in a research laboratory elsewhere, or in a company. By law, internships in commercial companies in France must be salaried. The internship is evaluated on the basis of a written report and an oral examination in front of a jury.

The S9 semester runs from the beginning of September to the end of March, and the S10 semester runs from the beginning of April until the middle of September (at the latest). Each semester is worth 30 ECTS.

It is potentially possible for a non-francophone student to complete the year without any teaching in French, but the choice of courses open to the student will be very limited. This is changing gradually, but the introduction of Masters programmes in English over the coming years is likely to accelerate this change.

We offer accommodation on campus to all international students registering for the full year, even if they subsequently do their internship elsewhere.

#### 3.3 M2 Master (60 ECTS)

Students with an academic level judged equivalent to the 1<sup>st</sup> year of a Masters programme can apply for admission to the second year of a Masters programme. Admission is decided by the admissions committee for each Master, not by the Commission for University Exchanges.

The Masters programmes consist of two semesters – S9 and S10 – with taught courses in S9 and a research project or internship in S10. The S9 semester runs from the beginning of September to the end of March and the S10 semester runs from the beginning of April until the middle of September (at the latest). Each semester is worth 30 ECTS.

The final project or internship is evaluated on the basis of a report and an oral examination in front of a jury. By law, internships in commercial companies must be salaried.

### 3.3 Certificat de Formation à la Recherche (30 or 60 ECTS)

The *Certificat de Formation à la Recherche* (Certificate in Research Training) is a *Diplôme d'Établissement* which can last either one (30 ECTS) or two semesters (60 ECTS). The essential element of the programme is an extended research project carried out in one of the laboratories on campus. For the full year programme, it is possible to do two different research projects, each for one semester. Students who are not French-speaking take lessons in French as a Foreign language, provided by the ECL.

Students can also attend any of the taught courses from the 3 year engineering programme, either as auditors or for credits.

In some cases it is possible for students on the 2 semester programme to do an extended research project in which the first semester of research is performed in one of the laboratories on campus and the second semester is performed as a paid internship with an industrial partner. In this case, the student must take 100 hours of taught courses in the first semester, in parallel with the research project, in order to qualify as an intern, under French employment law.

The *Certificat de Formation à la Recherche* is evaluated on the basis of a written report and an oral examination in front of a jury. Where possible, a member of the teaching staff from the home university is included in this examination jury.

The entire programme can be conducted in English, since all the research groups at the Ecole Centrale de Lyon speak English; the final report can be written in English, and the oral exam can be held in English.

Students registered for the CFR will be offered a room on campus.

### 3.4 Double Degree 1-2 (120 ECTS)

The *Double Degree 1-2* offers students the possibility to study the core curriculum (S5, S6, S7 & S8) together with the associated internships for the two years, and obtain the *Diplôme d'Ingénieur de l'Ecole Centrale de Lyon*. It is only open to students from establishments with whom we have a specific Double Degree agreement; this is because the programme in each establishment validates part of the engineering degree programme in the other establishment. The degrees from both establishments are awarded at the end of the combined programme – it is necessary for the student to validate the programme in *both* establishments in order to obtain the two degrees.

Students registered for the DD1-2 will be offered accommodation on campus for the two years.

### 3.5 Double Degree 2-3 (120 ECTS)

The *Double Degree 2-3* offers students the possibility to study part of the core curriculum (S5 or S7 followed by S6 or S8) and then the final year (S9 and S10), together with the associated internships for the two years, and obtain the *Diplôme d'Ingénieur de l'Ecole Centrale de Lyon*. It is only open to students from establishments with whom we have a specific Double Degree agreement; this is because the programme in each establishment validates part of the engineering degree programme in the other establishment. The degrees from both establishments are awarded at the end of the combined programme – it is necessary for the student to validate the programme in *both* establishments in order to obtain the two degrees.

The choice of semesters for the first year (S5 or S7 followed by S6 or S8) will be made jointly by the student, the student's home establishment and the Ecole Centrale de Lyon. When registering for the DD2-3 it will **not** be possible to select the *Option* and *Métier* for the final year – students will apply for admission to these during their first year at the Ecole Centrale de Lyon, along with all the other students, and they will follow the same selection process.

Students registered for the DD2-3 will be offered accommodation on campus for the two years.

### 3.6 Extended Programme with an additional sabbatical term

Students from countries with a staggered academic year (essentially those in the Southern hemisphere) and registered for one of the academic exchange programmes, can extend their stay in France by doing an additional internship (i.e. from September until February). But because this is a new academic year in France:

- Students must register at the Ecole Centrale de Lyon for an additional year
- To qualify for the status of intern, they must follow a minimum of 100 hours of courses in the academic year (this is a requirement of French employment law).

Consequently:

1. The sabbatical term option **must** be included in the exchange agreement with the home establishment, otherwise, by law, we must charge full registration fees for this additional year.
2. To meet the obligation of 100 hours of taught courses, students usually register for online courses with the CNAM, at a cost of approximately 600€. This fee must be paid by the student, and will not be covered by any agreement between the Ecole Centrale de Lyon and the home institution.

### 3.7 Masters thesis (30 ECTS)

In some situations it may be possible for a student registered for a Masters degree in their home institution to perform the research for their Master's thesis in one of the laboratories at the Ecole Centrale de Lyon, without paying bench fees.

For this to be possible:

1. The programme should be declared in the exchange agreement with the home institution
2. The student should have the agreement of a research supervisor in a laboratory at the Ecole Centrale de Lyon
3. The student will have to register for the *Certificat de Formation à la Recherche* and meet all the requirements of that programme. This is imperative, in order to comply with French employment law concerning internships. The production of a final report, and the accompanying oral exam are essential parts of this programme, and cannot be dispensed with.

## Appendix A – The Core Curriculum

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### Semester 5

*Beginning of September – end of January*

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#### Group A

Electrical and control engineering  
Fluid mechanics and thermodynamics  
Mathematics  
Economics and management

#### Group B

Information technology  
Computer science  
Mathematics  
Economics and management

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Engineering profession – project, site visits, sport, professional interviews  
Languages – choice of 9

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### Semester 6

*Beginning of February – end of June*

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#### Group A

Mechanical engineering  
Solid mechanics and structural engineering  
Information technology  
Computer science

#### Group B

Materials science  
Physics of materials  
Electrical and control engineering  
Fluid mechanics and thermodynamics

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Engineering profession – project, site visits, sport, professional interviews  
Languages – choice of 9

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### Semester 7

*Beginning of September – end of January*

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#### Group A

Materials science  
Physics of materials  
Social sciences

#### Group B

Mechanical engineering  
Solid mechanics and structural engineering  
Social sciences

Specialization – 2 advanced courses from a choice of 32

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Engineering profession – project, site visits, sport, professional interviews  
Languages – choice of 9

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## Semester 7 – Specialization courses

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### Group 1

Power electronics  
Electromechanical conversion  
Non-linear control engineering  
Multi-sensor, multi-actuator control  
Multimedia – concepts and technologies  
Algorithms for problem solving  
Concurrent distributed applications in Java  
Data analysis and pattern recognition  
Probability theory and random processes  
Deterministic and probabilistic methods for PDE's  
Numerical methods for ODE's and PDE's  
Mathematical statistics and econometrics  
Embedded systems architecture  
Optimal filtering and information transmission  
Architectures for computing and data processing  
Smart sensor networks: interface systems

### Group 2

Multibody mechanical systems  
Mechanical engineering  
Vibration analysis  
Inelastic behaviour of structures  
Material damage and failure  
Materials and innovative surface treatments  
Amorphous materials for innovative structures  
Biomechanics of living tissues and joints  
Turbulence and instability  
Acoustics and waves in fluids  
Supersonic flows  
Combustion and thermodynamics  
Quantum mechanics and applications  
Molecular and supramolecular chemistry  
Electrochemistry and chemitronics  
Semiconductor solid-state physics

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## Appendix B – S8 courses

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### Group A

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Finite Element Method  
 GUI programming in C++  
 Life, information and systems  
**Numerical methods for mechanics**  
**Mechanical metamaterials**  
 Mechanics of thin structures  
**Rotor dynamics**  
 Optics and photonics  
 Issues in sustainable development

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### Group C

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Mathematical biology  
 Interactive design and Fablab practices  
 Image sensing and processing  
 Multiphysics simulation in mechanical design  
**Observation and analysis of materials**  
 Microwave circuitry  
 Fundamental soil mechanics  
 Philosophy of science and technology  
 Corporate finance

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### Group E

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Algorithms and reasoning  
 Surfaces, friction, vibrations  
**From microscale to macroscale in mechanics**  
**Selection of materials**  
**Aircraft turbojets**  
 Industrial process engineering  
 Globalization and transculturalities  
 Collaborate and manage in the era of digital technologies

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### Group B

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Functional analysis  
 Collaborative algorithms and applications  
 Non-destructive testing  
 Nuclear engineering  
 Health engineering  
 Development of technological products  
 Design of sustainable packaging  
 Political sociology  
**Introduction to meteorology and oceanography**

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### Group D

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Webapps  
**Adaptive filtering – active noise control**  
 PLM – Digital mockup  
 Physics and chemistry of surfaces and interfaces  
 Ecology and environment  
**Introduction to random vibrations**  
**Two phase flow in energy systems**  
 Wind turbines  
**Space physics and solar-terrestrial coupling**  
 Machine learning  
 Interpersonal communication and professional practices

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### Group F

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Order within chaos  
 Insulating materials for electrical engineering  
**Intelligent mecatronic systems**  
 Musical acoustics  
 Antenna, signals and processors  
 Society and its waste  
 Polymers, physical properties and innovation  
**Optimal design and computational fluid mechanics**  
 Entrepreneurship and innovation  
 Financial markets  
 Probability theory and random processes

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### Courses in bold are taught in English

Each course consists of 32 taught hours, organised in 8 blocks of 4 hours.

The list of courses offered in S8 varies each year – this is the list for 2021-22. Full details of the courses will shortly be available on the internet.

## Appendix C The final year programme at the Ecole Centrale de Lyon

Students must take:

- A Métier
- An Option
- 2 Modules Ouverts Métier
- 6 Modules Ouverts Disciplinaires
- 3 Modules Ouverts Sectoriels

### C.1 The Métiers

Students choose one of 6 Métiers:

- Consultant
- Research and Development
- Logistics and Supply Chain
- Eco-design
- Entrepreneur & intrapreneur
- Environmental and Technological Risk Management

Each Métier consists of 92 taught hours plus 30h of project work. The teaching is programmed between September and November.

### C.2 The Options

Students choose one of 7 Options

- Aeronautics (*Aéronautique*)
- Bio-engineering and Nanotechnology (*Bio-Ingénierie et Nanotechnologies*)
- Energy (*Energie*)
- Information science and technology (*Informatique*)
- Mathematics and strategy (*Mathématiques et Décision*)
- Sustainable environment (*Transition Ecologique et Territoires*)
- Transportation engineering (*Transport et Trafic*)

Each option consists of 50 taught hours and 80 hours of project work. The option is timetabled for the period January- end of March.

### C.3 Modules Ouverts Métiers

Students must choose 2 – one may be imposed by the choice of Métier

Group A	Group B
Engineered systems	Quality assurance
Industrial management	Economic intelligence and intellectual property
Industrial and commercial law	Human resources
	<b>Environmental hazards</b>

Each course consists of 14 hours of lectures.

**Courses in bold are taught in English.**

## C.4 Modules Ouverts Disciplinaires

Students must choose 6 – one may be imposed by the choice of Option

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### Group A

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Computational Fluid Dynamics  
Big data challenges  
Elastic waves  
Green computing  
Human physiology and biotechnology  
Nanotechnologies  
Information systems for business  
**Fluid-structure interaction**

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### Group C

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Nanophotonics  
Statistics for engineering science  
Secure embedded systems  
Combustion  
Processing and analysis of audio and video data  
**Durability of materials and structures**  
**Introduction to acoustics**  
**River hydraulics**  
Stability of mechanical systems  
Electric power systems

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### Group E

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Introduction to non-linear vibrations  
Diagnosis and system health monitoring  
Mechanical assembly: architecture and geometry  
Tribology  
**Climate change and geo-engineering**  
Aerodynamic noise  
Physics for Information Technology  
Computer networks  
Engineering of a mass-produced object

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### Group B

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**Fundamentals of turbomachinery**  
**Ocean and coastal engineering**  
Deep learning and Artificial Intelligence  
Energy storage and conversion  
Uncertainties and heterogeneities in structures  
Soft matter: nanosystems and biological interfaces  
Machine learning and data mining  
**Stochastic processes**  
**Composite materials and structures**

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### Group D

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**The physics of turbulence**  
Power plant turbine technology  
System identification and sparse decomposition  
Operational research  
Construction materials  
Autonomous microsystems  
Structural dynamics  
Handling structured data  
Material behaviour  
Variational methods for PDE's

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### Group F

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**Environmental acoustics**  
Ground investigation  
Advanced control engineering  
Database systems  
**External aerodynamics**  
Dynamics of biological human systems  
Characterisation of surfaces and nanostructures  
Nuclear Energy  
Numerical methods for PDE's

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### Courses in bold are taught in English

Each course consists of 16 hours of lectures and 12 hours of practical work. These courses are timetabled from the middle of September until the end of December.

This list of courses is the programme that will be offered in 2021-22; the programme changes a little each year. Full details of the courses will shortly be available on the internet.

### C.4 Modules Ouverts Sectoriels

Students must choose 3 – one may be imposed by the choice of Option. Students choose these courses in December of the final year.

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#### Group A

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**Transonic aerodynamics**

Algorithms for decision making

Electromagnetic compatibility

**Hydrology and hydrogeology**

Geotechnical engineering

Tissue engineering and biomaterials

**Stability of rotating machines**

Intrapreneur

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#### Group B

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**Transportation noise**

Computer graphics

Design of installations for power generation

Atmospheric pollution

Strategic management

**Structural and system health monitoring**

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#### Group C

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Advanced vehicle dynamics

Material selection and composites

Hybrid vehicles

Managing business I.T. systems

**Physical problems in unbounded media**

Microsystems, bio-sensors and micro-fluidics

Civil engineering works

Start-up creation

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#### Group D

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**Active control of noise and vibration**

Macro energy

Traffic modelling and management

Information technology

Complex phenomena in structural dynamics

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#### Group E

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Functionalized thin layers and surfaces

Dynamics of mechanisms

**Unsteady flows in turbomachinery**

**Management of natural resources**

Interactive data visualisation

Time series econometrics

Energy and environmental impact

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### Courses in bold are taught in English

Each course consists of 28 taught hours, organised in 7 blocks of 4 hours.

The courses are timetabled from January until the middle of March.

This list of courses is the programme that will be offered in 2021-22; the programme changes a little each year. Full details of the courses can be found here: ????

## Appendix D Masters Programmes

In France a Masters programme usually lasts 2 years (M1 & M2) and may have several specializations (*parcours*). The Ecole Centrale de Lyon offers a range of Masters programmes, usually in collaboration with other establishments in Lyon and St Etienne; for most of the Masters programmes, the ECL only offers some of the specializations in each Master, and only at the M2 level. Currently (2020-21), much of the teaching in the Masters programmes is in French, but this is changing, and the ECL is applying for accreditation for 9 new specializations, to be taught entirely in English. The ECL also offers 3 International Masters programmes taught entirely in English.

Admissions to the Masters programmes are decided by the admissions committee for each programme.

Students can only be exempted from registration fees for the Masters programme, if this option has been included in the exchange agreement with the home institution.

### D.1 International Masters Programmes

The programmes cover the two years of a standard French Masters degree (M1 and M2) but students who have already attained the M1 level can be admitted directly to the second year (M2) at the discretion of the admissions committee for the Master.

- Acoustics (jointly with the University of Adelaide, Australia)
- Aerospace (jointly with the Technical University, Darmstadt)
- Nanoscale engineering

### D.2 French Masters Programmes

These programmes are taught mainly in French, and the ECL only accepts students for the 2<sup>nd</sup> year (M2) for some of the specializations. In general, these specializations are taught in collaboration with other establishments, and students should expect to have some of their teaching on other campuses in Lyon.

- Materials science
  - *Innovative materials for health, transport and energy*
- Econometrics and statistics
  - *Risk management in Insurance and Finance*
- Electrical, Electronic and Control engineering
  - *Electronic and embedded circuits*
  - *Engineering of control systems*
  - *Electrical engineering*
- Civil Engineering
  - *Energy efficient buildings*
  - *Materials and structures for sustainable construction*
  - *Ground and infrastructure engineering*
  - *Urban mobility*
- Industrial engineering
  - *Advanced methods in industrial engineering*
- Information technology
  - *Data science*
  - *Artificial intelligence*
  - *Image processing*
  - *Systems, networks and virtual infrastructure*
  - *Information technology for the web*

- Health engineering
  - *Medical imaging, signals and systems*
  - *Design and optimisation of health products*
- Applied mathematics and statistics
  - *Maths in action*
- Mechanics
  - *Fluid mechanics and thermodynamics*
  - *Biomechanics*
  - *Structural and system dynamics*
  - *Tribology and surface engineering*
- Optical engineering, image, vision and multimedia
  - *Surface and Interface science and engineering*
- Environmental Risk
  - *Environmental risk management*
- Ocean, Atmosphere and Climate Science
  - *Climate science*
  - *Air quality*