

INSA

INSTITUT NATIONAL
DES SCIENCES
APPLIQUÉES
LYON

2020-2021

ENGINEERING COURSES TAUGHT IN ENGLISH AT INSA LYON

FOR EXCHANGE
STUDENTS



INSA Lyon
#1 French School
of Engineering for
Research and
Innovation

2018 Industrie &
Technologies ranking

INTRODUCTION

INSA Lyon offers a wide range of courses in Science & Technology, from undergraduate level up to PhD. High proficiency in Science and Technology combined with a humanistic lens and openness to the society and the world are key values of the INSA education model. More than 1000 students graduate every year from INSA Lyon, hired by companies worldwide.

The INSA curriculum is a 5-year program and leads to the « Diplôme d'ingénieur », equivalent to a Master of Science. It is divided into two tracks:

- Year 1 and 2: a common track for all engineering students to ensure strong fundamental knowledge
- Year 3, 4 and 5, organized in **9 engineering fields named Departments.**

Exchange students are welcome to all INSA Lyon Departments. A majority of courses have to be taken in one of the 9 Departments, then additional courses can be chosen in another. One semester cannot exceed 30 ECTS credits. On average 1 ECTS credit= 20 hours of lectures in-class and personal work. **Exchange students can simulate their choice of courses prior to coming to INSA Lyon on : exchange-student.insa-lyon.fr**

Company internship opportunities are available following one academic semester. The internship is carried out under the supervision of a Department with international students keeping their exchange student status and visa. Each Department has its own organization and network among the numerous global companies and SMEs located in our region, ranking first for industry in France.

INSA Lyon is also **a research center** with more than 600 researchers working in 23 laboratories, combining education activities and close links with companies and public authorities. It promotes a cross-disciplinary approach towards 5 main societal challenges:

- Digital Society and Information
- Energy for a Sustainable Development
- Environment: Natural, Industrial, and Urban Environments
- Global Health and Bioengineering
- Transport: Structures, Infrastructures, and Mobilities

www.insa-lyon.fr/en/research

French as Foreign language

INSA Lyon has its dedicated language center. Among 10 languages, French as a Foreign language (FLE) is taught by a professional team. Summer school and semester courses are available for international students and are strongly recommended even though they choose courses taught in English.

INSA Lyon was recently qualified again with the highest rate [3*] delivered by the French Government.



BIOSCIENCES



The Department of Biosciences trains multidisciplinary engineers, intended to be project managers, specialized in Healthcare, Agro-food and Environmental industries.

2 main training programmes are offered in the Department: Biochemistry and Biotechnologies provides engineers with a solid scientific and technical background in Life Sciences and Healthcare; shapes them to work in Environmental, Pharmaceutical, Agro-Food and various other fields of chemistry; trains them for management positions, quality control and consulting in industries.

Bio-Informatics and Modeling, designed in collaboration with the University Claude Bernard Lyon 1, trains engineers to be interfaces between biologists, mathematicians and computer scientists; analyze and process biological data, extract relevant information and model biological systems in order to understand the processes of life.



SEMESTER 1 [SEPTEMBER - JANUARY]

Ordinary Differential Equations and Modeling	4 ECTS
Algorithmics and Computer Programming	3 ECTS
Computer Architecture and Operating Systems	1 ECTS
Databases	1 ECTS
Linear Algebra and Matrix Analysis	2 ECTS
Population Genetics and Dynamics	4 ECTS
Difference Equations, PDE	4 ECTS
Theoretical Computer Science	2 ECTS
Artificial Intelligence	3 ECTS
Stochastic Processes and Stochastic Calculus for Biology	2 ECTS
Signal and Image Analysis	2 ECTS
Project in Biological Systems Simulation	2 ECTS
Modeling of Biological Networks	3 ECTS
Structural Virology	2 ECTS



SEMESTER 2 [FEBRUARY - JUNE]

Partial Differential Equations and Modeling	2 ECTS
Software Development	3 ECTS
Software Development Project	1 ECTS
X-Ray Crystallography	1 ECTS
High Performance Computing and Development	2 ECTS
Game Theory	1 ECTS



SEMESTER 1, SEMESTER 2

RESEARCH PROJECT

FULL TIME 30 ECTS / HALF TIME 15 ECTS

The research project will take place in a laboratory associated with the Department of Biosciences. The student will be mentored by an experienced teacher. Topics are defined independently or in collaboration with companies.

> Associated labs

BF2I – Functional Biology, Insects and Interaction
<http://bf2i.insa-lyon.fr/en/>

CARMEN – Cardio-Metabolism, Diabetes and Nutrition
<http://carmen.univ-lyon1.fr/?lang=en>

ICBMS – Institute for Molecular and Supramolecular Chemistry and Biochemistry
<http://www.icbms.fr/>

MAP – Microbiology, Adaptation and Pathogenesis Laboratory
<http://map.univ-lyon1.fr/>

> Contact : ri-bs@insa-lyon.fr





CIVIL ENGINEERING AND URBAN PLANNING



Vinci Construction : visite Musée de la Confluence
15 mai 2012

The Department of Civil Engineering and Urban Planning provides education in the scientific and technical fields of civil engineering and urban planning:

- Building Design, Construction and Management
- Infrastructure Design, Construction and Management
- Urban Development and Renovation.

Major scientific fields addressed: Geotechnics; Material and Structural Analysis; Heat and Mass Transfer; Indoor and Outdoor Acoustics and Lighting; Heating, Ventilation, and Air Conditioning [HVAC]; Building Energy Management; Water Management and Hydraulics.

A particular attention is paid to cross-disciplinary fields of study: Engineering and Management Tools; Environmental Science; Humanities; Economics and Social Science.



COURSE	SEMESTER	NUMBER OF ECTS
Mathematics	S1	2
Computer-Aided Design [CAD]	S2	1
Urban drainage	S1 or S2	1,5
Adapting cities for climate change	S2	6
Numerical modelling in geomechanics	S2	6
CHOICE OF 1 MODULES OUT OF 3:	S2	
Energy management in Buildings	S2	6
Building design: multidisciplinary approach	S2	6
Integrated urban water management	S2	6



SEMESTER 1 (SEPTEMBER - JANUARY), **SEMESTER 2** (FEBRUARY - JUNE)

INDIVIDUAL PROJECT

15 ECTS

Bachelor degree level

The topic and program are defined with a mentor from the Department and are related to Civil Engineering.

RESEARCH AND DEVELOPMENT PROJECT

FULL TIME 30 ECTS / HALF TIME 15 ECTS

Master degree level

The project aims at developing the following knowledges and abilities:

- Understand the nature of R&D activities and challenges for innovation;
- Acquire advanced knowledge in some fields of civil engineering and urban planning, and/or acquire knowledge in complementary fields;
- Discover the limits between well founded knowledge and incomplete/uncertain knowledge;
- Implement scientific principles and methods on a specific research project;
- Develop general abilities [project management, writing reports and scientific papers, oral communication, etc.]

The subject and program are defined with a mentor from the Department and are related to :

- Heat & Mass Transfers in Buildings
- Materials and Structures
- Soils, Geo-materials
- Urban Techniques & Society [a good level of French can be required - for this domain only]
- Urban Water Management

> Associated labs

CETHIL - Energy and Thermal Engineering
cethyl.insa-lyon.fr

DEEP - Waste Water Environment Pollutions
deep.insa-lyon.fr

EVS - Environment City Society
umr5600.cnrs.fr

GEOMAS - Geomechanics, Materials and Structures
geomas.insa-lyon.fr

MATEIS - Materials Science Laboratory
mateis.insa-lyon.fr/en

TRIANGLE - Action, discourses, economic and political thought
triangle.ens-lyon.fr

> Contact: gcu-ri@insa-lyon.fr

ELECTRICAL ENGINEERING



The Department of Electrical Engineering trains multidisciplinary engineers in the field of electrical systems. This training provides students with theoretical and practical knowledge in Electronics, Electrotechnical engineering, Automation, Industrial Informatics and Telecommunications [EEAIT]. Activities related to EEAIT include: electronic systems for professional and public environments, integrated circuit design, energy production and management, control and supervision of production systems, information technology, telecommunications equipment, network operators...



SEMESTER 1 (SEPTEMBER - JANUARY)

Transmission Lines	2 ECTS
Electronics and Sensors	4 ECTS



SEMESTER 2 (FEBRUARY - JUNE)

Heat transfer	2 ECTS
Microcontroller [hardware and software], Design of a Numerical Analysis Software	2 ECTS



SEMESTER 1, SEMESTER 2

TECHNICAL PROJECT 3 ECTS

The project is carried out by a group of students [2 or 3] and covers various aspects of Electrical Engineering. The aim is to design, carry out, test and validate a device or an electrical system defined by a customer. Through this project, students develop initiative and autonomy skills but also their ability to defend their choices and results.

RESEARCH PROJECT 20 ECTS

Master degree level

The research project takes place in one of the labs associated to the Electrical Engineering Department. An experienced teacher will mentor the student. Topics are most of the time raised by the researcher himself or in collaboration with companies.

> Contact : ge-secretariat@insa-lyon.fr

> Associated labs

AMPERE - Electrical engineering, electromagnetism, automation, environmental microbiology and applications
ampere-lab.fr

CITI - Center of Innovation in Telecommunications and Integration of Services
citi-lab.fr

CREATIS - Biomedical Imaging Research Lab
creatis.insa-lyon.fr

ICJ - Institut Camille Jordan, Mathematical Sciences
math.univ-lyon1.fr

INL - Lyon Institute of Nanotechnology
inl.cnrs.fr

LGEF - Electrical Engineering and Ferroelectricity Lab
lgef.insa-lyon.fr





ENERGY AND ENVIRONMENTAL ENGINEERING



The Department of Energy and Environmental Engineering (GEn) of INSA Lyon offers training opportunities for future professionals, operating in the fields of energy and environmental sciences.

The multi-skill academic program enables our students to work in various sectors including energy production and supply, energy efficiency, HVAC and building energy performance, energy consulting, process engineering, waste management, etc.



SEMESTER 1 (SEPTEMBER - JANUARY), SEMESTER 2 (FEBRUARY - JUNE)

RESEARCH AND DEVELOPMENT PROJECT

25 OR 30 ECTS

This internship is an initiation to scientific research carried out under the supervision of an experienced researcher. It aims to deepen knowledge and abilities in a research problem in scientific English, and to develop experimental or computational skills. At the end of the internship, the student is expected to demonstrate that he/she can conduct a research project and that he/she has learned how to work independently in a research team. It requires creative, self-critical and communication skills. The project is carried out in one of the following themes: energy, heat transfer (CETHIL laboratory) or environmental sciences in waste, water and soil (DEEP laboratory).



SEMESTER 1 (SEPTEMBER - JANUARY)

Challenges and opportunities in environmental management	4 ECTS
Energy transition: waste & biomass resources	5 ECTS
Energy transition: from fossil fuel to renewable energy - Energy market	5 ECTS
Energy transition: project	3 ECTS
Wastewater treatment	3 ECTS
Energy optimisation	2 ECTS
Numerical analysis using EXCEL/VBA	2 ECTS
Numerical methods using Matlab	2 ECTS
Research and development project	25 or 30 ECTS
Short research project	15 ECTS



SEMESTER 2 (FEBRUARY - JUNE)

Computational fluid dynamics software	2 ECTS
Chemical engineering simulation software	2 ECTS
Numerical analysis using Matlab	2 ECTS
Research and development project	25 or 30 ECTS
Short research project	15 ECTS

> Contact : gen-s@insa-lyon.fr

> Associated labs

CETHIL - Energy and Thermal Engineering
cethyl.insa-lyon.fr

DEEP - Waste Water Environment Pollutions
deep.insa-lyon.fr/en

INDUSTRIAL ENGINEERING



Industrial engineering concerns production systems, supply and/or distribution of goods or services, their design, implementation, management and improvement with a systemic vision. Industrial engineers are multidisciplinary. They are production managers, able to design, implement and manage complex industrial systems while considering all the technical, organizational, financial and human factors. They are involved in organising the company in accordance with the principles of sustainability. They apply their skills to improve performance, quality and safety.



SEMESTER 1 (SEPTEMBER - JANUARY)

Design of Experiments	1 ECTS
Mechanical properties of materials	3 ECTS
Probabilities and Statistics	3 ECTS
Project management	1 ECTS
Scheduling and flow management	2 ECTS
Simulation - Overview	1 ECTS
Data Warehouse	2 ECTS
Supply chain and implementation of production systems	3 ECTS
Sourcing process and supplier survey	1 ECTS
Lean	3 ECTS
Introduction to scientific research	1 ECTS
Object-Oriented design and Modeling	2 ECTS
Optimization of the decision chain	2 ECTS
Distributed information systems	2 ECTS
Data analysis	2 ECTS



SEMESTER 2 (FEBRUARY - JUNE)

Quality-Maintenance	2 ECTS
Linear Programming and Optimization	1 ECTS
Lean	2 ECTS



SEMESTER 1, SEMESTER 2

RESEARCH PROJECT

FULL TIME 30 ECTS / HALF TIME 15 ECTS

The reception and supervision of students takes place in a scientific laboratory. The student works on a well-defined scientific problem, following a project approach, which requires managing objectives, planning, monitoring and deliverables. The host laboratories are DISP and AMPERE. Available on application and selection, and depending on subject availability.

> Contact: gi@insa-lyon.fr

> Associated labs

AMPERE - Electrical engineering, electromagnetism, automation, environmental microbiology and applications
ampere-lab.fr

DISP - Decision and Information Systems for Production systems
disp-lab.fr

> Associated labs

LAMCOS - LaMCoS - Contacts and Structures Mechanics Laboratory
lamcos.insa-lyon.fr

LIRIS - Computer Science Laboratory for Image Processing and Information Systems
liris.cnrs.fr





MECHANICAL ENGINEERING



The Department of Mechanical Engineering aims to train mechanical engineers in the fields of innovation, R&D and product design and manufacturing. They develop the capacity to carry out major projects, from an original idea to an end product.

2 sites: one on the main campus LyonTech-La Doua and the other in Oyonnax, in the heart of the Plastics Vallée. Therefore, some courses take place on the Oyonnax campus.

Areas of activity : energy, transports, biomedical and health, sports and leisure, mechatronics and robotics, luxury industry, mechanical constructions and industrial machinery, eco-industry, buildings, plastics processing...



SEMESTER 1 (SEPTEMBER - JANUARY)

Engineering Mathematics 1	4 ECTS
Fluid Mechanics	6 ECTS
Engineering materials	6 ECTS
Computer science & Numerical methods	4 ECTS
Mechanism analysis	6 ECTS
Multi-Physics System modelling	6 ECTS



SEMESTER 2 (FEBRUARY - JUNE)

Analysis of Structural Vibrations	6 ECTS
Theory of Elasticity	6 ECTS
Control of Linear Systems	6 ECTS
Mechanical Design of machine elements	6 ECTS
Friction & tribology	3 ECTS
Engine & powertrain analysis	3 ECTS



SEMESTER 1, SEMESTER 2

RESEARCH/ENGINEERING PROJECTS

FULL TIME 30 ECTS / HALF TIME 15 ECTS

The exchange students will work closely with a faculty member on a project which is related to industrial or academic research activities, in one of the associated labs to the Department listed below.

> Contact : gm-direction@insa-lyon.fr

> Associated labs

AMPERE - Electrical engineering, electromagnetism, automation, environmental microbiology and applications
ampere-lab.fr

CETHIL - Energy and Thermal Engineering
cethil.insa-lyon.fr

CREATIS - Research Centre for Image Acquisition and Processing for Health
creatis.insa-lyon.fr

DISP - Decision and Information Systems for Production systems
disp-lab.fr

IMP - Polymer Materials Engineering
imp.cnrs.fr

LAMCOS - Contacts and Structures Mechanics Laboratory
lamcos.insa-lyon.fr

LMFA - Fluid Mechanics and Acoustics Laboratory
lmfa.ec-lyon.fr

LVA - Vibrations and Acoustics Laboratory
lva.insa-lyon.fr

MATEIS - Materials Science Laboratory
mateis.insa-lyon.fr/en

COMPUTER SCIENCE AND INFORMATION TECHNOLOGY



The Department of Computer Science and Information Technology (IF) offers a general and wide-ranging training recognized among the best in the field in France. All the IT areas are covered [industry, management and science] with emphasis on engineering activities, modelling and integration of complex systems. According to INSA Lyon model core values, students also acquire the foundations of complementary disciplines like teamwork, project management, customer relation and proficiency in foreign languages.

Each promotion is sponsored by a large company. IT graduates work in many sectors such as consulting and software firms, software publishing, large companies in the tertiary sector, computer hardware, etc. They generally occupy positions as research engineers, project managers, experts, consultants, architects or entrepreneurs.



SEMESTER 1 [SEPTEMBER - JANUARY]

Security and advanced networks	2 ECTS
Data Analytics & Machine Learning	6 ECTS
Privacy and Ethics	6 ECTS
Parallel and GPU computing	6 ECTS
Cloud Computing and Distributed Systems	6 ECTS
Cybersecurity - blockchain and secure multiparty computation	6 ECTS
Programming infrastructure and paradigms for Big Data	6 ECTS



SEMESTER 2 [FEBRUARY - JUNE]

ESoftware Engineering and Modelling	3 ECTS
Data Management for the Web	2 ECTS



SEMESTER 1, SEMESTER 2

RESEARCH PROJECT

10, 20 OR 30 ECTS

The research project takes place in one of the labs associated to the Department. An experienced teacher will mentor the student. Topics cover almost all the areas of computer science. Exchange students have to precise their subject to their academic advisor in the Department. They can choose the duration and the amount of work they want to dedicate to their project, so they can take other courses. Therefore different amounts of ECTS credits can be assigned to the research project.

> Contact : omar.hasan@insa-lyon.fr

> Contact : if.direction@insa-lyon.fr

> Associated labs

CITI - Center of Innovation in Telecommunications and Integration of Services
Citi-lab.fr

DISP - Decision and Information Systems for Production systems
disp-lab.fr

LIRIS - Computer Science Laboratory for Image Processing and Information Systems
liris.cnrs.fr





INFORMATION SCIENCES AND TECHNOLOGY



The Information Science & Technology Semester is a program jointly organized by 3 engineering departments of INSA Lyon :

- **Telecommunication Department**
- **Computer Sciences and Engineering Department**
- **Electrical Engineering Department**

In collaboration with 3 research laboratories: **CITI, CREATIS, LIRIS**.

A full IST semester program is composed of six scientific courses [to be chosen out of 12] associated to a research project, conducted in one of the 3 research laboratories and which develops high level research in the fields covered by the IST semester. Each week of the IST semester program is structured with 2 days of courses and 3 days in research labs. Note that, the French language course [2 hours per week] is given all throughout the semester in parallel to these courses and projects.



SEMESTER 1 (SEPTEMBER - DECEMBER)

TELECOMMUNICATIONS

Signal and Image Processing Part 1 - Signal Processing	3 ECTS
Signal and Image Processing Part 2 - Signal Processing	3 ECTS
Microwave Systems for Telecommunications Part 1 - Transmission lines	3 ECTS
Microwave Systems for Telecommunications Part 2 - Antennas and Propagation	3 ECTS

IT

Java Programming	3 ECTS
Middleware design and implementation	3 ECTS
Operating Systems	3 ECTS
Data bases and data mining Part 1 - Data Bases	3 ECTS
Data bases and data mining Part 2 - Data Mining	3 ECTS
Software Engineering	3 ECTS

NETWORKS AND SERVICES

Part 1 - Networks	3 ECTS
Part 2 - Networks	3 ECTS

RESEARCH PROJECT

10 ECTS

The students will choose a subject and work within a research team. They will have to build up a bibliographic study in order to develop their own contributions which will be presented in a final report and during an oral presentation. This research project can finish at the end of January.



SEMESTER 2 (FEBRUARY - JUNE)

RESEARCH PROJECT

30 ECTS

The students can lead a research project during a whole semester and thus have enough time to deepen a project and develop a complex and elaborated contribution. A publication and/or a bachelor thesis can be validated at the end of this period.

Subjects cover a wide range of IT fields

Examples of defended thesis:

- Big Data Analytics with Counter-Strike CS:GO
- National Instruments Wireless Transmission Platform
- Programming Distributed Systems in Vert.X & Golo.

> Contact : ist@listes.insa-lyon.fr - www.insa-lyon.fr/en/ist

> Associated labs

CITI - Center of Innovation
in Telecommunications and Integration of Services
citi-lab.fr

CREATIS - Biomedical Imaging Research Lab
creatis.insa-lyon.fr

LIRIS - Computer Science Laboratory
for Image Processing and Information Systems
liris.cnrs.fr

MATERIALS SCIENCE AND ENGINEERING



The Department of Materials Science and Engineering (SGM) trains general engineers whose competencies range from the conception to the manufacturing of built-up products in advanced technology industries.

Those industries concern the fields of advanced materials (semiconductors, metals and alloys, polymers, composites, ceramics) and micro and nanotechnologies components.

Materials engineers take part in research and development, design, production, quality in different fields such as the industry of electronic components, petrochemistry, iron and steel industry, automotive, aeronautics, construction, energy, packaging, biomedical, cosmetics etc.



SEMESTER 1 [SEPTEMBER - JANUARY]

Physics of Materials – Solid state physics	3 ECTS
Electronics - Electronic circuits Signal Systems	3 ECTS
Mechanics – Elasticity and beam mechanics	2 ECTS
Material Mechanics – Mechanical behaviour of materials	4 ECTS
Materials engineering – Material selection	2 ECTS
Nanotechnology – Nanofabrication of advanced integrated circuits	2 ECTS
Optoelectronics – Photonic materials and components	2 ECTS
Microelectronics Integrated Electron Devices	2 ECTS
Nanotechnology and Semiconductors	2 ECTS
Chemistry – Polymer formulation and blends	2 ECTS
Materials and Life Science - Biomaterials	2 ECTS
Material Mechanics - Mechanics of Architected Materials	2 ECTS



SEMESTER 2 [FEBRUARY - JUNE]

Electronics – Semiconductor Materials	2 ECTS
Finite Elements Simulation	2 ECTS



SEMESTER 1, SEMESTER 2

RESEARCH PROJECT

FULL TIME 30 ECTS / HALF TIME 15 ECTS

The research project will take place in a laboratory associated with the Department of Materials and Engineering. The student will be mentored by an experienced teacher. Topics are mostly suggested by a company.

Examples of defended thesis :

- Simulation of hip implants : optimization of the shape of the implants according to the patient
- 3D manufacturing of metals by robocasting
- Effect of an applied current on phase transformations.

> Contact: sgm@insa-lyon.fr

> Associated labs

IMP - Polymer Materials Engineering
imp.cnrs.fr

INL - Lyon Institute of Nanotechnology
inl.cnrs.fr

MATEIS - Materials Science Laboratory
mateis.insa-lyon.fr

ECTS = European Credits Transfer System



SGM

INSA SHORT PROGRAMS

INSA Lyon offers international students the possibility of a short stay on its vibrant campus, located in France's Capital of Gastronomy and European Capital of Smart Tourism in 2019. During the program students will gain experience in innovative scientific fields, develop social science skills and learn French. INSA Lyon short programs give them credits and lead them to open themselves to others, in a multicultural environment. Participants agree that INSA Lyon short programs gave them a stepping stone for further studies and a boost for their career.



SMART LYON - MARCH

2 weeks - 2 ECTS

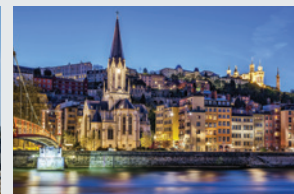
• COURSES (30 CONTACT HOURS)

1. Smart Cities
2. French as a foreign language



• ACTIVITIES

Cultural visits in Lyon and surroundings, social activities organised by students associations.





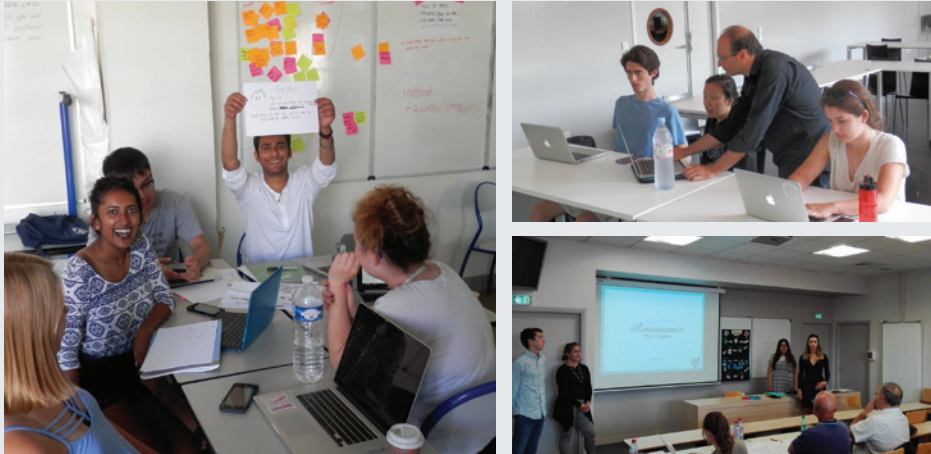
INNOV@INSA - MAY-JUNE

4 weeks | 6 US / 12 ECTS credits

• **COURSES (90 CONTACT HOURS)**

1. Connected devices and Smart devices
2. Management and Innovation in Europe
3. French language, cross-cultural communication, industry and society

Students have to choose between track 1 or 2. Track 3 is mandatory.



• **ACTIVITIES**

Cultural visits in Lyon and surroundings, social activities organised by students associations.



> For further information: www.insa-lyon.fr/en/innovinsa-may-june

INSA SHORT PROGRAMS



INNOV@INSA - JUNE-JULY

4 weeks | 12 ECTS credits

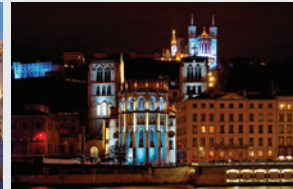
• COURSES (90 CONTACT HOURS)

1. Management and Innovation in Europe
2. French language, cross-cultural communication, industry and society



• ACTIVITIES

Cultural visits in Lyon and surroundings, social activities organised by students associations.



> For further information: www.insa-lyon.fr/en/innovinsa-july

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