CentraleSupélec

Course catalogue

Engineer Specializing in Physics

Third year

Metz Campus of CentraleSupélec

last update: January 25, 2026

Semester 9

ISP-PHY-S09-30	**Photonic Engineeering S09**	**7 ECTS**

ISP-PHY-S09-31	**Nanoengineering S10**	**5 ECTS**

ISP-PHY-S09-32	**Quantum Engineering S09**	**5 ECTS**

ISP-PHY-S09-34	**Capstone Project S09**	**6 ECTS**

ISP-PHY-S09-12		**Humanities Management and Business Development S09**	**3 ECTS**
SPM-HEP-020	1	Legal and regulatory systems	12.0 h
SPM-HEP-015	1	Innovation	35.0 h

ISP-PHY-S09-06		**Modern Languages S09**	**4 ECTS**
LV1S09	1	Foreign Languages and Culture 1	21.0 h
LV2S09	1	Foreign Languages and Culture 2	21.0 h

Semester 10

ISP-PHY-S10-33		**Industrial Physics S10**	**7 ECTS**
SPM-PHY-026	2	Biophysics	18.0 h

ISP-PHY-S10-35	**Capstone Project S10**	**4 ECTS**

ISP-PHY-S10-13		**Humanities Management and Business Development S10**	**2 ECTS**
SPM-HEP-007	1	Financial management	15.0 h
SPM-HEP-022	1	Management	19.0 h

ISP-PHY-S10-07		**Modern Languages S10**	**2 ECTS**
LV1S10	1	Foreign Languages and Culture 1	11.5 h
LV2S10	1	Foreign Languages and Culture 2	11.5 h

ISP-PHY-S10-01		**to be translated**	**15 ECTS**
SPM-STA-003	1.0	End-of-studies internship	0.0 h

Legal and regulatory systems

Course supervisor: Damien Rontani, Hervé Frezza-Buet

Total: 12.0 h **CM:** 6.0 h, **TD:** 6.0 h

SPM-HEP-020 *back*

Description: The objective of this course, through a concrete example, is to help students become familiar with the regulatory environment of engineers. One lecture will present the services of the State and their relationships with local authorities, as well as the different levels of regulations. A practical session will allow students to work on a real case, such as the installation of a photovoltaic field, a biogas plant, a wind farm, etc.

Learning outcomes: By the end of this course, students will have acquired knowledge of the legal and regulatory systems that influence engineering practice, particularly those governing environmental protection and ecological transition.

Evaluation methods: Assessment will be based on the summary report written according to the guidelines provided in the tutorials, using the documents studied.

CM:

1. Acteurs et instruments de la transition énergétique (3.0 h)
2. Appréhender les grands ensembles normatifs (3.0 h)

TD:

1. présentation du projet (1.5 h)
2. identifier les démarches à accomplir (urbanisme, environnement) et les interlocuteurs (3.0 h)
3. rédaction de la note de synthèse (1.5 h)

Innovation

Course supervisor: Ninel Kokanyan

Total: 35.0 h **CM:** 17.0 h, **TD:** 16.0 h

SPM-HEP-015 *back*

Description: If innovation is a driver of progress, it is above all a driver of economic growth. Driven by entrepreneurs and intrapreneurs, it must develop today for the benefit of citizens and the environment: "Innovation for Good" summarizes the motto. Innovation is also an adventure, a risky bet in an unknown environment. But entrepreneurs have tools and methodologies that allow them to navigate, reduce risks, and turn their vision into value for themselves and for society. The objective of this course is to familiarize students with these tools, giving them the means to embark on the entrepreneurial journey. The course follows the same logic as innovation projects, from idea generation and ideation to funding and market launch. It alternates between presenting concepts and applying them to innovation projects proposed by the students themselves. The module is assessed through a final start-up pitch, which crystallizes the acquisition of all the concepts presented.

Learning outcomes: By the end of this course, students will have mastered tools and methodologies for creative development, understand the legal framework to protect and enhance innovation, and acquire the skills necessary to carry out innovative projects within a company or as an entrepreneur.

Evaluation methods: Each group will pitch their project for 5 minutes in front of a jury composed of the various instructors. Assessment will focus on the quality and content of the pitch, as well as on the project files, which includes the different elements developed during each session and constitutes a coherent argument describing the project's value, innovative aspects, and feasibility.

Evaluated skills:

- Research / Innovation
- Business Intelligence

CM:

1. Introduction : L'entrepreneur et l'intrapreneur au cœur de la destruction créative comme moteur de l'innovation. (2.0 h)
2. Design Thinking, de l'idéation au prototype. (2.0 h)
3. Eléments d'éco-design et innovation. (1.0 h)
4. Le business model canvas comme outil de visualisation des projets d'innovation. (2.0 h)
5. L'innovation ouverte comme accélérateur d'innovation. (3.0 h)
6. Protéger l'innovation grâce aux outils de la PI. (2.0 h)
7. L'innovation et le droit des entreprises : créer son entreprise. (2.0 h)
8. Créer son business plan et rechercher des financements. (2.0 h)
9. Pitcher son projet comme une start-up : outils. (1.0 h)

TD:

1. Créativité et problématisation des projets d'innovation. Brainstorming et Value-Proposition Canvas (2.0 h)
2. Créativité et Design thi'nk'ing, vers un premier prototype par groupe projet (2.0 h)
3. La fresque du numérique et l'impact environnemental du numérique (3.0 h)
4. Créativité et Design thi'nk'ing, suite du prototype par groupe projet (4.0 h)
5. Mise en pratique du BMC dans les contextes des groupes projet (2.0 h)
6. Pitch des BMC devant jury (1.0 h)
7. Pitcher son projet comme une start-up : outils, atelier et mise en pratique. (2.0 h)

Foreign Languages and Culture 1

Course supervisor: Elisabeth Leuba

Total: 21.0 h **TD:** 21.0 h

LV1S09 *back*

Description: The first foreign language is generally English. Students are divided into level groups ; in class, work is not only focused on the 4 language competences but also on various topics studied in depth according to students' levels. Topics cover a range of fields, such as civilisation, society and the professional world. Limited class size enables active participation and significant improvement in the language. The educational approach is varied: group work, class presentations, specific exercises, research, debates, etc.

Learning outcomes: At the end of the course, students will have improved their ability to communicate in an international professional, academic or personal context.

Evaluation methods: Assessment will be by continuous assessment according to criteria to be determined by each teacher, taking into account personal investment in the course. Each course will be marked out of 20 at the end of the semester.

Evaluated skills:

- Management

TD:

1. Cours (21.0 h)

Foreign Languages and Culture 2

Course supervisor: Beate Mansanti

Total: 21.0 h **TD:** 21.0 h

LV2S09 *back*

Description: Students are offered a range of second foreign languages at different levels, including for beginners. Students are divided into level groups; in class, work is not only focused on the 4 language competences but also on various topics studied in depth according to students' levels. Topics cover a range of fields, such as civilisation, society and the professional world. Limited class size enables active participation and significant improvement in the language. The educational approach is varied: group work, class presentations, specific exercises, research, debates, etc.

Learning outcomes: At the end of the course, students will have improved their ability to communicate in an international professional, academic or personal context.

Evaluation methods: Assessment will be by continuous assessment according to criteria to be determined by each teacher, taking into account personal investment in the course. Each course will be marked out of 20 at the end of the semester.

Evaluated skills:
- Management

TD:

1. Cours (21.0 h)

Biophysics

Course supervisor: Victor Colas

Total: 18.0 h **CM:** 10.5 h, **TD:** 6.0 h

SPM-PHY-026 *back*

Evaluation methods: Written test, 1h30

Evaluated skills:
- Physical Engineering Design
- Physical Modeling
- Data Processing

CM:

1. Introduction (3.0 h)
2. Techniques d'imagerie (3.0 h)
3. Techniques de spectroscopie (3.0 h)
4. Biophotonique et simulation (1.5 h)

TD:

1. Techniques de spectroscopie (1.5 h)
2. Biophotonique et simulation (1.5 h)
3. Travaux Experimentaux (TrEx) (3.0 h)

Financial management

Course supervisor: Hervé Frezza-Buet, Damien Rontani

Total: 15.0 h **CM:** 7.5 h, **TD:** 7.5 h

SPM-HEP-007 *back*

Description: This module aims to equip engineering students with the fundamentals of financial management applied to innovative projects and entrepreneurship. Specifically designed for technical profiles involved in the creation or development of startups, it combines a rigorous accounting approach (reading and interpreting the balance sheet, income statement, cash flow statement, cost analysis) with a detailed understanding of innovation-specific financing mechanisms (fundraising, venture capital, grants, cash flow forecasting, company valuation). The course is structured around a continuous case study: a fictional tech startup that students follow through its development, progressively applying financial analysis and management tools. The module pays particular attention to the specifics of tech companies (intangible assets, SaaS KPIs such as CAC or CLV, adapted valuation methods) and also introduces key strategies for managing financial risks. The pedagogy is interactive, with group work, Excel simulations, and oral presentations, preparing students to make informed financial decisions in complex, dynamic, and uncertain environments.

Learning outcomes: By the end of this course, students will be able to interpret financial statements and develop strategies to finance ambitious projects.

Evaluation methods: Multiple-choice exam + case study presentation

Evaluated skills:

- Business Intelligence

CM:

1. Introduction à la gestion financière pour l'innovation (1.0 h)
2. Lecture des états financiers : bilan, compte de résultat, flux de trésorerie (1.0 h)
3. Comptabilité analytique & analyse de rentabilité (1.0 h)
4. Trésorerie et besoin en fonds de roulement (BFR) (1.0 h)
5. Méthodes d'évaluation des startups (1.5 h)
6. Stratégies de financement de l'innovation (1.0 h)
7. Gestion des risques financiers liés à l'innovation (1.0 h)

TD:

1. Analyse d'états financiers simplifiés (2.0 h)
2. Application à la structure de coûts de la startup (1.0 h)
3. Construction d'un plan de trésorerie (1.0 h)
4. Valorisation de la startup fictive (1.5 h)
5. Construction d'une stratégie de financement (1.0 h)
6. Finalisation & restitution de l'étude de cas (1.0 h)

Management

Course supervisor: Damien Rontani, Hervé Frezza-Buet

Total: 19.0 h **TD:** 19.0 h

SPM-HEP-022 *back*

Description: The objective of this course is to help students understand personal and interpersonal dynamics in a professional context, enabling them to manage their careers and projects effectively and humanely.

Evaluated skills:
- Management

TD:

1. tbd (19.0 h)

Foreign Languages and Culture 1

Course supervisor: Elisabeth Leuba

Total: 11.5 h **TD:** 11.5 h

LV1S10 *back*

Description: The first foreign language is generally English. Students are divided into level groups ; in class, work is not only focused on the 4 language competences but also on various topics studied in depth according to students' levels. Topics cover a range of fields, such as civilisation, society and the professional world. Limited class size enables active participation and significant improvement in the language. The educational approach is varied: group work, class presentations, specific exercises, research, debates, etc.

Learning outcomes: At the end of the course, students will have improved their ability to communicate in an international professional, academic or personal context.

Evaluation methods: Assessment will be by continuous assessment according to criteria to be determined by each teacher, taking into account personal investment in the course. Each course will be marked out of 20 at the end of the semester.

Evaluated skills:

- Management

TD:

1. Cours (11.5 h)

Foreign Languages and Culture 2

Course supervisor: Beate Mansanti

Total: 11.5 h **TD:** 11.5 h

LV2S10 *back*

Description: Students are offered a range of second foreign languages at different levels, including for beginners. Students are divided into level groups; in class, work is not only focused on the 4 language competences but also on various topics studied in depth according to students' levels. Topics cover a range of fields, such as civilisation, society and the professional world. Limited class size enables active participation and significant improvement in the language. The educational approach is varied: group work, class presentations, specific exercises, research, debates, etc.

Learning outcomes: At the end of the course, students will have improved their ability to communicate in an international professional, academic or personal context.

Evaluation methods: Assessment will be by continuous assessment according to criteria to be determined by each teacher, taking into account personal investment in the course. Each course will be marked out of 20 at the end of the semester.

Evaluated skills:

- Management

TD:

1. Cours (11.5 h)

End-of-studies internship

Course supervisor: Hervé Frezza-Buet, Damien Rontani

SPM-STA-003 *back*

Evaluated skills:

- Physical Engineering Design
- Physical Modeling
- Data Processing
- Systems Analysis
- Research / Innovation
- Business Intelligence