

# Course catalogue

## **Computer Science Engineer**

Third year

Metz Campus of CentraleSupélec

last update: June 27, 2025

## Semester 9

ISP-INF-S09-09		Computer Science 2 S08	9.5 ECTS
3MD4050	2.5	Statistical models 2	33.0 h

ISP-INF-S09-1	0	Computer Science 1 S08	6.5 ECTS
3MD4010	2	Machine learning 2	21.5  h
3MD4030	2	HPC-HPDA on GPU with CUDA	22.5 h

ISP-INF-S09-11	Final Project S09	7 ECTS
SPM-PRJ-006 1	Final project	72.0 h

ISP-INF-S09-25 HEP S09 3 ECTS

ISP-INF-S09-19	Foreign Language S09	4 ECTS
LV1S09 1	Foreign language and culture 1	21.0 h
LV2S09 1	Foreign language and culture 2	21.0 h

## Semester 10

ISP-INF-S10-12	Final Project S10	4 ECTS
SPM-PRJ-006 1	Final project	42.0 h

ISP-INF-S10-1	13	Artificial Intelligence S10	7 ECTS
3MD4120	2	Reinforcement learning	23.0 h
SPM-INF-018	2	Advanced databases	23.0 h
3MD4150	3	Natural language processing	36.0 h
3MD4110	2	Perspectives in Learning and Artificial Intelligence	23.5  h

ISP-INF-S10-26 HEP S10 2 ECTS

## ISP-INF-S10-14 nd-of-studies Internship 15 ECTS

ISP-INF-S10-20	Foreign Language S10	2 ECTS
LV1S10 1	Foreign language and culture 1	11.5 h
LV2S10 1	Foreign language and culture 2	11.5 h

#### STATISTICAL MODELS 2

Course supervisor: Frédéric Pennerath

**Total:** 33.0 h

3MD4050

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

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**Evaluation methods:** 3h written test, can be retaken.

- Modelling
- Research and Development

#### MACHINE LEARNING 2

#### $\textbf{Course supervisor: } Arthur \; Hoarau$

<b>Total:</b> 21.5 h	<b>CM:</b> 10.5 h, <b>TP:</b> 9.0 h
3MD4010	back

**Description:** This course complements Machine Learning 1 with notions of data processing (dimension reduction, etc.), unsupervised learning, active and semi-supervised learning, explicability issues.

Learning outcomes: By the end of this course, students will have completed their breadth approach to machine learning.

Evaluation methods: 2h written test, can be retaken.

- Research and Development
- Development

## HPC-HPDA ON GPU WITH CUDA

**Course supervisor:** Stéphane Vialle

**Total:** 22.5 h

3MD4030

**CM:** 6.0 h, **TD:** 4.5 h, **TP:** 12.0 h

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#### $\label{eq:exact} \textbf{Evaluation methods: } Practical \ reports$

#### Evaluated skills:

• Development

#### FINAL PROJECT

### Course supervisor: Hervé Frezza-Buet

**Total:** 72.0 h

SPM-PRJ-006

#### **Evaluated skills:**

- Development
- Modelling
- Management
- Research and Development

**Projet:** 72.0 h

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#### Foreign language and culture 1

#### Course supervisor: Elisabeth Leuba

#### **Total:** 21.0 h

LV1S09

**TD:** 21.0 h

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**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.

- Research and Development
- Consulting
- Business Intelligence
- Management

#### Foreign language and culture $2 \$

#### Course supervisor: Beate Mansanti

#### **Total:** 21.0 h

LV2S09

**TD:** 21.0 h

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**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.

- Research and Development
- Consulting
- Business Intelligence
- Management

#### FINAL PROJECT

### Course supervisor: Hervé Frezza-Buet

**Total:** 42.0 h

SPM-PRJ-006

#### **Evaluated skills:**

- Development
- Modelling
- Management
- Research and Development

**Projet:** 42.0 h

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#### Reinforcement learning

#### Course supervisor: Hervé Frezza-Buet

Total: 23.0 h (optional)

3MD4120

CM: 9.0 h, TD: 3.0 h, TP: 9.0 h

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**Description:** The course first covers the theoretical concepts of reinforcement learning: MDP, dynamic programming and value functions (Policy iteration, Value Iteration), model-free methods (Temporal Differences, SARSA, Q-Learning). These concepts are then extended to continuous systems where the value function must be approximated (LSTDQ, DeepRL, ...). These fundamentals will enable a better understanding of current successes in Artificial Intelligence, such as AlphaZero and, to a lesser extent, Chat-GPT.

**Learning outcomes:** Understanding of the theoretical aspects of reinforcement learning and their implementation with deep learning techniques.

Evaluation methods: 2h written test, can be retaken.

- Modelling
- Research and Development

#### Advanced databases

#### Course supervisor: Stéphane Vialle

Total: 23.0 h (optional)

SPM-INF-018

CM: 9.0 h, TD: 3.0 h, TP: 6.0 h, Projet: 4.5 h

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 $\ensuremath{\textbf{Evaluation methods:}}\xspace$  Project report and defense

- Modelling
- System
- Development

#### NATURAL LANGUAGE PROCESSING

Course supervisor: Joël Legrand

**Total:** 36.0 h

3MD4150

**CM:** 9.0 h, **TP:** 25.0 h

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**Evaluation methods:** 2h written test, can be retaken.

- Research and Development
- Business Intelligence

#### Perspectives in Learning and Artificial Intelligence

Course supervisor: Joël Legrand

**Total:** 23.5 h

3MD4110

**CM:** 8.5 h, **TP:** 15.0 h

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- Research and Development
- Development

#### Foreign language and culture 1

#### Course supervisor: Elisabeth Leuba

**Total:** 11.5 h

LV1S10

**TD:** 11.5 h

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**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.

- Research and Development
- Consulting
- Business Intelligence
- Management

#### Foreign language and culture $2\,$

#### Course supervisor: Beate Mansanti

#### **Total:** 11.5 h

LV2S10

**TD:** 11.5 h

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

- Research and Development
- Consulting
- Business Intelligence
- Management