ENGINEERING DEGREE, ENGLISH TAUGHT PROGRAM - Semester 8

Teaching Unit	ECTS Credits	Code	Module	Lecture	Lecture & Tutorial	Tutorial	Personnal work
ES-TEC4BS2 CORE PROGRAM	3,5	ICO4108	Machine Learning	12,00	.	15,00	36,00
	2,0	ENT4120	Sustainable Business, Corporate Social Responsibility and Digital Sobriety	.	6,00	13,50	21,00
	1,0	ENT4302	Seminar	6.00 3.00 On.	.	12,00	0,00
	2,5	INF4064	NoSql	6,00	.	15,00	25,00
	2,0	INF4065	GPU programming	6,00	.	9,00	25,00
	0,0	LAN4084AN	Remedial English Cond.	18,00	.	.	0,00
ES-PRO4BS2 PROJECT & ENTERPRISE	1,0	PLU4002	Challenges and certifications	.	.	.	20,00
	12,0	PLU4191	Project in Digital Science and Technology	.	.	.	240,00
SWE4BS2 SOFTWARE ENGINEERING S8	3,5	INF4051	Application architecture	6,00	.	18,00	46,00
	2,5	INF4063	Software development using DevOps	6,00	.	12,00	32,00
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ICO4108 Machine Learning

Information

Course name	Machine Learning
French course name	Machine Learning
Credits/ECTS	3.5
Optional/Mandatory	Mandatory
Professor (Paris Campus)	PREVOST L.
Professor (Laval Campus)	PREVOST L.
Programs	Engineering Degree Engineering Degree, English Taught Program Engineering Degree by apprenticeship

Course Hours

Lecture	12.00 hour(s)
Tutorial/Lab	15.00 hour(s)

Evaluation

Grading	Lab/Tutorial, Final Exam,
Final exam	1.50 hour(s)

Course Syllabus

Learning outcomes	Understand the principles and objectives of supervised learning from examples. Master the algorithms (nearest-neighbor, multilayer and convolution networks). Be able to size and optimize an algorithm on a training dataset and using a validation set. Measure the impact of parameters on performance and avoid overlearning.

Content and chapters

1. INTRODUCTION

Applications in decision support: examples and principles

Data and datasets

Classification or regression?

2. DECIDING WITHOUT LEARNING

The k-nearest neighbor algorithm

Computing distance between data

Boundary between classes

Influence of k on bias and variance

Advantages and disadvantages

3. ARTIFICIAL NEURON AND LEARNING

Human intelligence (learning and reasoning)

Artificial intelligence

Natural neuron

Mathematical modeling

Learning: perceptron rule

Limitation to linearly separable binary problems

4. SINGLE LAYER NEURAL NETWORKS

Applications to multi-class problems

Learning: delta rule and gradient descent

5. MULTI-LAYER NEURAL NETWORKS

Need for hidden layer(s)

Learning: backpropagation

Decision: WTA/rejection

6. GOOD PRACTICES

Input/output pre-processing: normalization, class balancing

Stochastic gradient, total, mini-batch

Fixed, variable, optimal learning step (quasi-Newton method with BFGS algorithm)

7. PERFORMANCE MEASURES

Performance measures: error rate, rejection rate, confusion matrix, precision, recall, ROC curve, risk

Learning objective: minimize bias and variance

Validation set

Search for the number of hidden cells by cross-validation and early stopping

8. CONVOLUTION NETWORKS

Classical image processing techniques: convolution, SIFT, HOG and LBP operators

Convolution networks

Shared weights,

Convolution and pooling layers

Introduction to deep learning

Prerequisites	Statistics, linear algebra

ENT4120 Sustainable Business, Corporate Social Responsibility and Digital Sobriety

Information

Course name	Sustainable Business, Corporate Social Responsibility and Digital Sobriety	**Professor (Paris Campus)**	COURBIN P.
French course name	Développement Durable, RSE et sobriété numérique	**Professor (Laval Campus)**	COURBIN P.
Credits/ECTS	2.0	**Programs**	Engineering Degree Engineering Degree, English Taught Program Engineering Degree by apprenticeship
Optional/Mandatory	Mandatory		

Course Hours

Lecture/Tutorial(	6.00 hour(s)
Tutorial/Lab	13.50 hour(s)

Evaluation

Grading	Group project, Group presentation,
Final exam	0.00 hour(s)

Course Syllabus

Learning outcomes	This module aims to develop the systemic thinking skills of future engineers. At the end of this course, students will be able to - Understand new approaches (digital and beyond) - Question the role of the digital engineer - Define the scope of a project by integrating the entire ecosystem and its stakeholders - Classify the stakeholders in order of priority for action - Propose simple digital solutions by integrating various dimensions of sustainable development
Content and chapters	Chapter 1 Introduction: Sustainable Development & Digital Sobriety: Sharing facts, history, new models and examples Chapter 2 New tools to structure a project by designing it systemically
Prerequisites	Basic knowledge of Sustainable Development

ENT4302 Seminar

Information

Course name	Seminar	**Professor (Paris Campus)**	POIRIER S.
French course name	Colloque	**Professor (Laval Campus)**	POIRIER S.
Credits/ECTS	1.0	**Programs**	Engineering Degree Engineering Degree, English Taught Program
Optional/Mandatory	Mandatory		

Course Hours

Lecture	3.00 hour(s)
Online Lecture	3.00 hour(s)
Tutorial/Lab	12.00 hour(s)

Evaluation

Grading	Group project,
Final exam	0.00 hour(s)

Course Syllabus

Learning outcomes	Colloquium in Guébriant and on the campus: Meet with partner companies present and alumni Develop your professional network Becoming professional (CV, interview, salary negotiation...) Opening up to entrepreneurship Strengthen cohesion among 4A students
Content and chapters	In Guébriant and on the differents campus, alumni and diffrents contractor host thematic workshops on: The development of skills Knowing how to imagine the company you are looking for The professional project The professional network Negotiation: internship, alternance, first job Further training & international Entrepreneurship How to quit your first job The Spirit of Defense and Digital Sovereignty Partner companies also offer conferences and workshops on their professional activities.
Prerequisites	None

INF4064 NoSql

Information

Course name	NoSql	**Professor (Paris Campus)**	DA-RUGNA J.
French course name	NoSql	**Professor (Laval Campus)**	AUBIN J.
Credits/ECTS	2.5	**Programs**	Engineering Degree Engineering Degree, English Taught Program Engineering Degree by apprenticeship
Optional/Mandatory	Mandatory		

Course Hours

Lecture	6.00 hour(s)
Tutorial/Lab	15.00 hour(s)

Evaluation

Grading	Final Exam,
Final exam	1.00 hour(s)

Course Syllabus

Learning outcomes

Understand and manipulate NoSQL databases

Content and chapters

- Introduction (1h30)
  - BigData: needs and principles (4V)
  - NoSQL: principles (BASIC) and different types.
- MongoDB presentation (1h30)
  - Focus on Document Oriented NoSQL databases.
  - Features of MongoDB.
  - Different types of deployment architecture.
  - Good administration practices: backup, resilience, performance improvement, cybersecurity.
- MongoDB TP (3h)
  - Implementation of a simple MongoDB database.
  - Application of some good administration practices.
  - Command line database operation.
- Extract Transform Load (ETL) (1h30)
  - ETL Principles
  - Feedback on projects
  - Presentation of ELK and the practical work to follow: Support for reflection, difficulties ...
- TP ELK (6h)
  - Implementation of an ELK server
  - Taking into account of OpenData data provided by the teacher (in order to frame this lab)
  - Adaptation / filters of data according to the set context
  - Data exploitation via Kibana
- Results of the practical work (1h30)
  - Correction of the TP
  - Focus on the important concepts.

Prerequisites

3A courses : Databases, Operating systems and System administration.

INF4065 GPU programming

Information

Course name	GPU programming	**Professor (Paris Campus)**	BRIERE A.
French course name	Programmation GPU	**Professor (Laval Campus)**	BRIERE A.
Credits/ECTS	2.0	**Programs**	Engineering Degree Engineering Degree, English Taught Program Engineering Degree by apprenticeship
Optional/Mandatory	Mandatory		

Course Hours

Lecture	6.00 hour(s)
Tutorial/Lab	9.00 hour(s)

Evaluation

Grading	
Final exam	0.00 hour(s)

Course Syllabus

Learning outcomes	Understand the architecture of a GPU Know the programming techniques for GPUs Design parallel algorithms for GPU
Content and chapters	
Prerequisites	

LAN4084AN Remedial English

Information

Course name	Remedial English	**Professor (Paris Campus)**	COCKS J.
French course name	Anglais renforcé S8	**Professor (Laval Campus)**	DAVIDSON E.
Credits/ECTS	0.0	**Programs**	Engineering Degree Engineering Degree, English Taught Program Engineering Degree by apprenticeship
Optional/Mandatory	Mandatory		

Course Hours

Lecture (	18.00 hour(s)

Evaluation

Grading	Final Exam,
Final exam	1.25 hour(s)

Course Syllabus

Learning outcomes	Score 750 points in the TOEIC Listening and Reading
Content and chapters	Tricks and good practices in taking the TOEIC Exercises to improve each part of the TOEIC Listening and Reading
Prerequisites	none

INF4051 Application architecture

Information

Course name	Application architecture	**Professor (Paris Campus)**	IONASCU F.
French course name	Architecture d'applications	**Professor (Laval Campus)**	IONASCU F.
Credits/ECTS	3.5	**Programs**	Engineering Degree Engineering Degree by apprenticeship Engineering Degree, English Taught Program
Optional/Mandatory	Mandatory		

Course Hours

Lecture	6.00 hour(s)
Tutorial/Lab	18.00 hour(s)

Evaluation

Grading	
Final exam	0.00 hour(s)

Course Syllabus

Learning outcomes

- Define separations, layers, organize components and services
- Take into account technical constraints
- Document an architecture
- Create a client-server architecture

Content and chapters

- Architectural Design Principles
  - Separation of concerns
  - Modularity and encapsulation
  - Abstraction, information hiding
  - Low coupling and high cohesion
  - Scalability and Performance
  - Flexibility and scalability
  - Reusability and maintainability
- Principles of dependency search and dependency injection.
- Relations and communication between modules, their abstraction and the notion of high-level interface.
  - Interface standards (SOAP, REST)
  - API design principles; gateways
  - Synchronous-Asynchronous Messages
- Architectural styles (monolithic N-tier, client-server, micro-services, MVC, service-oriented)
- Selection of an architecture in relation to the software / system objective, design compromise.
- Architecture documentation - C4, UML; API Documentation

Possible practical realization:

heavy client, monolithic server, mySQL or MongoDB DB, REST API, in high level language (Java, Spring Framework)

Prerequisites

Object Oriented Programming

Tools for Software Development

Application Design

INF4063 Software development using DevOps

Information

Course name	Software development using DevOps	**Professor (Paris Campus)**	FARCY V.
French course name	Developpement logiciel en processus DevOps	**Professor (Laval Campus)**	FARCY V.
Credits/ECTS	2.5	**Programs**	Engineering Degree Engineering Degree by apprenticeship Engineering Degree, English Taught Program
Optional/Mandatory	Mandatory		

Course Hours

Lecture	6.00 hour(s)
Tutorial/Lab	12.00 hour(s)

Evaluation

Grading	Final Exam,
Final exam	1.00 hour(s)

Course Syllabus

Learning outcomes	`DevOps process for software development`
	
	`Design and maintain automatic pipelines for continuous integration, delivery and deployment`

Content and chapters	• DevOps Methodology • Continous integration, continous delivery, continuous deployment • The environments (dev, staging, test, production) • The monitoring, the metrics • Tools: Docker, Kubernetes, GitLab
Prerequisites	INF4052 Virtualisation, conteneurisation et déploiement cloud

PLU4002 Challenges and certifications

Information

Course name	Challenges and certifications	**Professor (Paris Campus)**	BRIERE A.
French course name	Challenges et certifications	**Professor (Laval Campus)**	REY R.
Credits/ECTS	1.0	**Programs**	Engineering Degree Engineering Degree, English Taught Program Engineering Degree by apprenticeship
Optional/Mandatory	Mandatory		

Course Hours

Evaluation

Grading	Individual Project,
Final exam	0.00 hour(s)

Course Syllabus

Learning outcomes	Acquire new experiences, knowledge and skills that complement the modules of the academic curriculum.
Content and chapters	Each student chooses two activities (2 moocs or 1 mooc/1 challenge or 2 challenges) per semester among those validated and referenced by the teaching staff. To be validated, a mooc must have a duration of at least 5 hours. In the case where a mooc has a duration of at least 40 hours, it can be accepted to validate the two activities requested.
Prerequisites	None

PLU4191 Project in Digital Science and Technology

Information

Course name	Project in Digital Science and Technology	**Professor (Paris Campus)**	FARCY V.
French course name	Projet scientifique et technique 4A	**Professor (Laval Campus)**	REY R.
Credits/ECTS	12.0	**Programs**	Engineering Degree Engineering Degree, English Taught Program
Optional/Mandatory	Mandatory		

Course Hours

Evaluation

Grading	Individual Project, Group project, Group presentation,
Final exam	0.00 hour(s)

Course Syllabus

Learning outcomes	At the end of this module, the students will be able to carry out a scientific and technical project in virtual aut
Content and chapters	This module defines the basics of operational project management in a context similar to a professional one. Students are entrusted with the mission of providing an answer to a problem proposed by a professional sponsor (company, teacher, research laboratory) or as part of a business creation. • Management of human relations associated with a project • Problematization • Definition and framework of a project • Study and proposal of the choice of solutions • Project organisation • Produce and verify compliance • Delivery documentation • Deliver
Prerequisites	

ENGINEERING DEGREE, ENGLISH TAUGHT PROGRAM - Semester 6

Teaching Unit	ECTS	Elective	Credits	Code	Module	Lecture	Lecture & Tutorial	Tutorial	Personnal work
MIF3BS2 COMPUTER SCIENCE	14.0		2.0	INF3043	Algorithmics, computability and complexity theory	12.00	.	12.00	13.00
			3.0	INF3134	Tools for Software development	9.00	.	30.00	13.00
			2.5	INF3040	System administration & CyberSecurity	6.00	.	24.00	16.00
			4.0	INF3048	WEB application development	12.00	.	33.00	13.00
			2.5	INF3032	Python as an engineering tool	9.00	.	21.00	23.00
ES-PRO3BS2 PROJECTS	4.0		2.0	PLU3034	Design sprint	3.00	.	21.00	0.00
			2.0	PLU3032	Technical challenges	1.50	.	24.00	0.00
SYS3BS2 PHYSICS, ELECTRONICS AND SYSTEMS	7.0		3.0	SYS3046	Microprocessor : peripherals and applications	9.00	.	27.00	39.00
			1.0	PHY3024	Quantum computing	12.00	.	6.00	23.00
			3.0	SYS3032	Mechatronic	9.00	.	27.00	39.00
HUM3BS2 ENGINEER PROFESSIONAL SKILLS	5.0		0.0	LANXX84XX	2nd language , FLE Opt.	(15.00)	.	.	(0.00)
			1.0	ENT3112	Macroeconomics and Finance	.	12.00	.	11.00
			2.0	LAN3082AN	English & TOEIC	21.00	.	.	29.00
			1.0	ENT3114	Career skills seminar	1.50	.	9.00	15.00
			1.0	ENT3116	Introduction to Ethics	.	12.00	.	13.00
			0.0	LAN1284AN	Remedial English Cond.	.	.	15.00	0.00

INF3043 Algorithmics, computability and complexity theory

Information

Course name	Algorithmics, computability and complexity theory	**Professor (Paris Campus)**	DA-RUGNA J.
French course name	Algorithmique, calculabilité et complexité	**Professor (Laval Campus)**	LE BERRE M.
Credits/ECTS	2.0	**Programs**	Engineering Degree Engineering Degree, English Taught Program
Optional/Mandatory	Mandatory		

Course Hours

Lecture	12.00 hour(s)
Tutorial/Lab	12.00 hour(s)

Evaluation

Grading	Lab/Tutorial, Final Exam,
Final exam	1.50 hour(s)

Course Syllabus

Learning outcomes	Recognize different classes of languages (regular, algebraic and contextual); Design recognizers for a given language; Determine the complexity of an algorithm; Identify the recursive structure of a problem for the development of dynamic programming; Be able to demonstrate the membership of a problem to the class P ; Be able to demonstrate that a problem belongs to the class NP-complete;
Content and chapters	Regular languages and finite automata Grammars Stacked automata and Turing machines Algorithmic complexity Complete enumeration and dynamic programming Class P: polynomial reductions and study of 2-SAT NP-complete class: membership proof of classical problems
Prerequisites	Know how to develop in Python Understand and know how to manipulate mathematical symbols and operators Understand and know how to manipulate (and, or, xor, implication, ...) Understand and know how to manipulate graphs (implementation and terminology)

INF3134 Tools for Software development

Information

Course name	Tools for Software development	**Professor (Paris Campus)**	IONASCU F.
French course name	Java & Outils pour le developpement logiciel	**Professor (Laval Campus)**	DA-RUGNA J.
Credits/ECTS	3.0	**Programs**	Engineering Degree Engineering Degree, English Taught Program
Optional/Mandatory	Mandatory		

Course Hours

Lecture	9.00 hour(s)
Tutorial/Lab	30.00 hour(s)

Evaluation

Grading	Lab/Tutorial, Final Exam,
Final exam	1.50 hour(s)

Course Syllabus

Learning outcomes

- Design and model a mono-component software program, using the object oriented programming
- Use collaborative tools for software development and build
- Prevent and detect errors: debugging techniques, unit tests

Content and chapters

- SOLID principles
- Design patterns: Strategy, Adapter, Facade, Observer and MVC, Singleton
- Build and version control
- Types of testing, unit tests, debugging

Tools: Java, JUnit, IntelliJ, Maven, Git/GitLab

Prerequisites

- Object Oriented Programming
- Java
- UML basics (class diagrams)

INF3040 System administration & CyberSecurity

Information

Course name	System administration & CyberSecurity	**Professor (Paris Campus)**	HEISS G.
French course name	Administration systèmes et sécurité informatique	**Professor (Laval Campus)**	AUBIN J.
Credits/ECTS	2.5	**Programs**	Engineering Degree Engineering Degree, English Taught Program
Optional/Mandatory	Mandatory		

Course Hours

Lecture	6.00 hour(s)
Tutorial/Lab	24.00 hour(s)

Evaluation

Grading	Final Exam, Group project,
Final exam	1.00 hour(s)

Course Syllabus

Learning outcomes

System administration

- Install, configure and operate an Active Directory © (A.D.).
- Interconnect client equipment (Linux, Windows) and interact with the A.D.
- Implement GPOs.
- Manage updates, logs and backups.

Identify cybersecurity challenges in the following areas

- Cyber risks and the organization of protection in society.
- Best practices for the user.
- Introduction to cryptology and virology.

Content and chapters	**System administration**
	
	• Presentation and implementation of a simplified AD domain with DHCP and DNS.
	• Presentation without implementation of advanced AD architecture (RODC, WSUS, kerberos ...).
	• Basics administrative functions for Microsoft (user rights, audit strategy, GPO, Powershell scripts ...).
	• Integration of Linux stations and servers in a Microsoft network.
	• Presentation of the concepts of Maintenance in Operational Conditions (MCO) and implementation of GLPi.
	• Introduction to fundamental security principles relating to the administration of an information system.
	
	IT security
	
	• Cybersecurity
	  • The main principles
	  • The risks
	  • Cybersecurity actors (state - company)
	• Cybersecurity and the Internet
	  • Social networks
	  • Good practices
	  • Legal obligations
	• Introduction to cryptography
	  • Classic and modern algorithms
	  • Hash functions
	  • Diffie Hellman
	• Introduction to virology
	  • History and definitions
	  • Types of infection
	  • Modes of propagation
	  • Antivirus

Prerequisites	3A courses : networks, operating systems

INF3048 WEB application development

Information

Course name	WEB application development	**Professor (Paris Campus)**	ZOGHLAMI S.
French course name	Développement d'applications WEB	**Professor (Laval Campus)**	LE BERRE M.
Credits/ECTS	4.0	**Programs**	Engineering Degree Engineering Degree, English Taught Program
Optional/Mandatory	Mandatory		

Course Hours

Lecture	12.00 hour(s)
Tutorial/Lab	33.00 hour(s)

Evaluation

Grading	Final Exam, Group project,
Final exam	2.00 hour(s)

Course Syllabus

Learning outcomes	Master the standard web technologies HTML, CSS, JavaScript (JS) and HTTP, as well as front-end JS frameworks to be able to develop responsive GUI deployable on web browsers.

Content and chapters	**Introduction to universal application development standards** (3h) • Overview of web standards • Visual Studio Code (VSCode): Integrated Development Environment for universal applications based on web standards • Hypermedia content structuring with HTML 2. **Visual styling of hypermedia content with CSS and responsive GUI design with CSS flexbox and CSS grid** (3h) **Introduction to JavaScript, a versatile multiparadigm and multiplatform programming language** (6h) • Expressions and primitive data structures • Variables, scope, functions, conditionals and closures • Assignment, lists (arrays), objects and iterations • State mutation • Prototypes and inheritance • Modules, Node, NPM and Yarn **Web browsers and their API** (3h) • Introduction to web browsers • The web browsers' Domain Object Model (DOM) et Browser Object Model (BOM) JS API • Programming browser-user interaction with Vanilla JS, the DOM and the BOM • Simple browser app example: the counter adder in Vanilla JS-HTML-CSS **End-to-end testing and debugging web browser GUI with Cypress and Chrome Dev Tools** (3h) • The Cypress browser app testing framework • Testing the counter adder app: functionalities, responsiveness • Debugging browser apps with Chrome Dev Tools • Debugging the counter adder app **Component and template based reactive GUI programming with Vue** (6h) • Structuring a GUI with Vue components • The application GUI scaffolder Vite • Vue Directives • Vue 3 reactivity: reactive, ref, toRef, toRefs • Vue 3 component hierarchy and cross-component communication • Vue 3 state management • Vue 3 component lifecycle and hooks • Reusing functionalities across components with Vue 3 composables • Programming page navigation with the Vue Router • Testing individual Vue components with Cypress • The counter adder app in Vue-JS-HTML-CSS **Web applications** (3h) • HTTP: the standard request-response client-server communication protocol • Asynchronous JS: the browser's event-loop, promises, async and await • Querying a web REST API with HTTP, fetch and axios • Web application architecture patterns and their evolution
Prerequisites	None

INF3032 Python as an engineering tool

Information

Course name	Python as an engineering tool	**Professor (Paris Campus)**	HAIDAR S.
French course name	Python outil de l'ingénieur	**Professor (Laval Campus)**	CLERGUE M.
Credits/ECTS	2.5	**Programs**	Engineering Degree Engineering Degree, English Taught Program
Optional/Mandatory	Mandatory		

Course Hours

Lecture	9.00 hour(s)
Tutorial/Lab	21.00 hour(s)

Evaluation

Grading	Lab/Tutorial, Final Exam,
Final exam	1.50 hour(s)

Course Syllabus

Learning outcomes	Reach an intermediate level of mastery of the Python language (conditional structures, loops, lists, functions, poo, use of libraries) Develop production engineering or scientific applications in Python
Content and chapters	Integrated course on the Python language: syntax and particularities Introduction to Numpy, Pandas, Matplotlib and Tkinter modules. Activity on plagiarism detection: reading files, stylistic comparison of texts and display of results. Activity on inventory management and sales forecasts: reading data, forecasting via the seasonality method and displaying curves. Activity on the scheduling of tasks in a workshop: implementation of Johnson and heuristics.
Prerequisites	Mastery of algorithms

PLU3034 Design sprint

Information

Course name	Design sprint
French course name	Design sprint 2
Credits/ECTS	2.0
Optional/Mandatory	Mandatory

Professor (Paris Campus)	FARCY V.
Professor (Laval Campus)	FOUCAULT A.
Programs	Engineering Degree Engineering Degree, English Taught Program

Course Hours

Lecture	3.00 hour(s)
Tutorial/Lab	21.00 hour(s)

Evaluation

Grading	
Final exam	0.00 hour(s)

Course Syllabus

Learning outcomes
Content and chapters
Prerequisites

PLU3032 Technical challenges

Information

Course name	Technical challenges	**Professor (Paris Campus)**	FARCY V.
French course name	Challenges techniques 2	**Professor (Laval Campus)**	FARCY V.
Credits/ECTS	2.0	**Programs**	Engineering Degree Engineering Degree, English Taught Program
Optional/Mandatory	Mandatory		

Course Hours

Lecture	1.50 hour(s)
Tutorial/Lab	24.00 hour(s)

Evaluation

Grading	Group project, Group presentation,
Final exam	0.50 hour(s)

Course Syllabus

Learning outcomes	Acquire new experiences, knowledge and skills that complement the modules of the academic curriculum.

Content and chapters	Day 01 - Monday Morning: Presentation of festival objectives and specific instructions (deadlines, evaluation, penalties, etc.) by the master of ceremonies. (20 minutes). Presentation of subjects by teachers (duration depends on number of subjects). Formation of teams and assignment of subjects (30 minutes). Afternoon: Exchange between teacher and groups: presentation of the additional notion, Q&A time (1 hour). Group work (reflection): Ownership of the project and definition of their objectives. Choice of 5 requirements. Definition of tasks to be carried out. Allocation of tasks and responsibilities between members. Non-technical responsibilities are not taken into account. Production of a deliverable to be uploaded to GitLab by 6pm. Day 02 - Tuesday Morning Technical analysis and design of the project: definition of classes, relationships, interface design. Definition and creation of unit tests. Production of a deliverable to be uploaded to GitLab by 12 noon. Afternoon development / implementation Day 03 - Wednesday development / implementation Day 04 - Thursday For groups: development. Afternoon Finalize development Preparation for presentation Last delivery on GitLab before 11:59 p.m. Day 05 - Friday Morning from 9am to 1pm, presentations: Afternoon: Communication of results and awards ceremony
Prerequisites	Basic level in software development

SYS3046 Microprocessor : peripherals and applications

Information

Course name	Microprocessor : peripherals and applications	**Professor (Paris Campus)**	TRABELSI C.
French course name	Microcontrôleurs : périphériques et applications	**Professor (Laval Campus)**	CRISON F.
Credits/ECTS	3.0	**Programs**	Engineering Degree Engineering Degree, English Taught Program
Optional/Mandatory	Mandatory		

Course Hours

Lecture	9.00 hour(s)
Lab	27.00 hour(s)

Evaluation

Grading	Midterm Exam, Group project,
Final exam	0.00 hour(s)

Course Syllabus

Learning outcomes	• Draw the interfacing diagram of a device from its documentation • Develop the low-level software to control a peripheral. • Develop a complete application architectured around a microcontroller and peripherals (sensors and actuators)
Content and chapters	I/O management methods (polling, interrupt, DMA) Development of low-level device drivers (examples for one input and one output) Time management methods (software and hardware) Peripheral interfacing: • Examples of digital/on-off inputs (buttons and anti-bounce, distance sensors, keyboard, quadrature encoder, etc.) • Examples of digital/binary outputs (leds, displays, multiplexed displays, screens, motors, electromechanical and solid state relays, etc.) • Analogue sensor interfacing (example of infrared distance sensor, potentiometer, etc.) • PWM (Pulse Width Modulation) control: control of servo-motors, brightness of a led, speed of a motor. • Serial communication: principles and advantages, differences between protocols (UART, SPI, I2C, USB, CAN), applications. Good practices • Debugging and testing • Optimisation of power consumption • Documentation Project: design and development of an application • Built around a microcontroller and peripherals • Development of a driver for a peripheral
Prerequisites	SYS3041, C-language

PHY3024 Quantum computing

Information

Course name	Quantum computing	**Professor (Paris Campus)**	WANG A.
French course name	Informatique quantique	**Professor (Laval Campus)**	WANG A.
Credits/ECTS	1.0	**Programs**	Engineering Degree Engineering Degree, English Taught Program
Optional/Mandatory	Mandatory		

Course Hours

Lecture	12.00 hour(s)
Tutorial/Lab	6.00 hour(s)

Evaluation

Grading	Lab/Tutorial, Final Exam,
Final exam	1.50 hour(s)

Course Syllabus

Learning outcomes	Understand the fundamental principles of quantum mechanics and the difficulties of understanding the quantum world
Content and chapters	- Introduction to the first experimental elements of the quantum world - Applications of the theory to simple systems (atom, oscillator, free particle) - Basic principles of quantum computing, advantages over classical informatics - Technological difficulties and prospects for quantum computing Chapter 1: Crises of classical physics Chapter 2: Birth of quantum mechanics Chapter 3: Fundamental principles of quantum mechanics and basic applications Chapter 4: Limites of classical computer science Chapter 5: Initiation of quantum information, the avantages (quantum supremacy) Chapter 6: Quantum entanglement Chapter 7: Difficulties and perspectives
Prerequisites	- Classical physics including Newtonian mechanics, wave theory, electromagnetism. - Using mathematical tools like derivative, integral, probability - Basic notions in classical informatics.

SYS3032 Mechatronic

Information

Course name	Mechatronic	**Professor (Paris Campus)**	LHERNAULT M.
French course name	Mécatronique	**Professor (Laval Campus)**	CRISON F.
Credits/ECTS	3.0	**Programs**	Engineering Degree Engineering Degree, English Taught Program
Optional/Mandatory	Mandatory		

Course Hours

Lecture	9.00 hour(s)
Lab	27.00 hour(s)

Evaluation

Grading	Midterm Exam, Lab/Tutorial,
Final exam	0.00 hour(s)

Course Syllabus

Learning outcomes	• Analyse the basic elements of an automatic control system. • To describe the difference between open-loop and closed-loop systems. • To study the operation and performance of different control strategies such as P, PI, PD and PID. • Interpret and apply graphical methods and tools such as Bode and Nyquist diagrams to study the stability of controlled systems
Content and chapters	• Control Concepts • Laplace Transform • Transfer Functions • Methods of Analysis • Graphical stability analysis • Impulse response, step response, transfer function, Bode and Nyquist diagrams • PID controller Laboratory work: • Computer aided design, simulation and analysis • Open loop transfer function of a DC Servo System • Closed loop position servo system • Analog PID control • Digital PID control
Prerequisites	SYS3041,SYS3045

LANXX84XX 2nd language , FLE

Information

Course name	2nd language , FLE	**Professor (Paris Campus)**	COCKS J.
French course name	LV2 opt, FLE	**Professor (Laval Campus)**	DAVIDSON E.
Credits/ECTS	0.0	**Programs**	Engineering Degree Engineering Degree, English Taught Program Engineering Degree Engineering Degree
Optional/Mandatory	Optional		

Course Hours

Lecture (	15.00 hour(s)

Evaluation

Grading	Final Exam,
Final exam	0.00 hour(s)

Course Syllabus

Learning outcomes	**Second languages** : German, Spanish, Japonese, Chinese Understand the language Use the language **French as a foreign language** Understand French Use French
Content and chapters	Content according to group
Prerequisites	none

ENT3112 Macroeconomics and Finance

Information

Course name	Macroeconomics and Finance	**Professor (Paris Campus)**	LENOIR O.
French course name	Macro Economie et Economie Industrielle	**Professor (Laval Campus)**	DA-RUGNA J.
Credits/ECTS	1.0	**Programs**	Engineering Degree Engineering Degree, English Taught Program
Optional/Mandatory	Mandatory		

Course Hours

Lecture/Tutorial(	12.00 hour(s)

Evaluation

Grading	Midterm Exam, Final Exam, Group project,
Final exam	1.50 hour(s)

Course Syllabus

Learning outcomes	The objectives of this module are to enable students to : - understand the main economic aggregates - differentiate between the macro and micro economies - identify the different factors of production and real and monetary trade flows in a sector - identify the different agents in a sector - learn how to manage an investment fund This course could also be entitled "Industrial Economics: Introduction to Sector Analysis".
Content and chapters	Chapter 1: Exploring General Economics: Economic Growth, Labour Markets and Public Policy and International Trade Define the main economic aggregates Analyse a press review on the 2008 crisis Chapter 2: Financial Markets and their instruments Know how to manage a fund taking into account the proposed risk assessments Chapter 3: Sectoral analysis The notion of Markets - Case study
Prerequisites	None

LAN3082AN English & TOEIC

Information

Course name	English & TOEIC	**Professor (Paris Campus)**	COCKS J.
French course name	Anglais et TOEIC	**Professor (Laval Campus)**	DAVIDSON E.
Credits/ECTS	2.0	**Programs**	Engineering Degree Engineering Degree, English Taught Program
Optional/Mandatory	Mandatory		

Course Hours

Lecture (	21.00 hour(s)

Evaluation

Grading	Individual presentation , Group presentation,
Final exam	0.25 hour(s)

Course Syllabus

Learning outcomes	Write a research analysis or article citing sources Speak about technology showing audience awareness Understand written and spoken English in a technical or scientific context
Content and chapters	Speaking about a technology Reading and presenting articles Academic writing Citation/Avoiding plagiarism Presentation techniques Presenting data
Prerequisites	No prerequisites

ENT3114 Career skills seminar

Information

Course name	Career skills seminar	**Professor (Paris Campus)**	DAOUDI A.
French course name	Séminaire Projet professionnel	**Professor (Laval Campus)**	FOUCAULT A.
Credits/ECTS	1.0	**Programs**	Engineering Degree Engineering Degree, English Taught Program
Optional/Mandatory	Mandatory		

Course Hours

Lecture	1.50 hour(s)
Tutorial/Lab	9.00 hour(s)

Evaluation

Grading	
Final exam	0.00 hour(s)

Course Syllabus

Learning outcomes
Content and chapters
Prerequisites

ENT3116 Introduction to Ethics

Information

Course name	Introduction to Ethics	**Professor (Paris Campus)**	None
French course name	Introduction à l'éthique	**Professor (Laval Campus)**	None
Credits/ECTS	1.0	**Programs**	Engineering Degree Engineering Degree, English Taught Program
Optional/Mandatory	Mandatory		

Course Hours

Lecture/Tutorial(	12.00 hour(s)

Evaluation

Grading	Final Exam, Individual Project,
Final exam	2.00 hour(s)

Course Syllabus

Learning outcomes	- Contextualize the origin of ethics and identify its fields of application (philosophical, political, economic, legal...) - Integrate the ethical dimension of the engineering profession - Identify key contemporary ethical debates and express an opinion - Assimilate skills of reflexivity, critical analysis and argumentation
Content and chapters	- What is ethics? Philosophical origins & meanings - Professional ethics of the engineer: his duties & responsibilities - Ethical decision-making
Prerequisites	Be interested in major contemporary debates (ecological transition, inclusion, gender equality, fight against all forms of discrimination...) and express a reasoned opinion

LAN1284AN Remedial English

Information

Course name	Remedial English
French course name	Anglais renforcé
Credits/ECTS	0.0
Optional/Mandatory	Mandatory

Professor (Paris Campus)	COCKS J.
Professor (Laval Campus)	COCKS J.
Programs	Engineering Degree Engineering Degree Engineering Degree Engineering Degree, English Taught Program

Course Hours

Tutorial/Lab	15.00 hour(s)

Evaluation

Grading	
Final exam	0.00 hour(s)

Course Syllabus

Learning outcomes
Content and chapters
Prerequisites