IPSA
ÉCOLE
D'INGÉNIEURS
DE L'AIR ET DE L'ESPACE

Master
in Aeronautical Engineering

Syllabus 2021-2022
for exchange students

IONIS
EDUCATION GROUP

First year of Master
(Aero 4)
Spring semester

The spring semester of the first year of master (Aero 4) includes:

- Human Sciences and Languages common pole focusing on Labor law and Business Sociology
- Corporate knwoledge common pole focusing on Management and Financial Management
- Engineering Sciences common core and Elective Modules
- 2 majors: SYSTEMS (SYS) and VEHICLES (VEH)
- 6 options - 3 for each major
    - SYSTEMS major : 3 options
      - Embedded systems & Telecommunication (SET)
      - Mechatronic systems (SM)
      - Space, Launchers & Satellites (ELS)
    - VEHICLES major: 3 options
      - Energetics & Propulsion (EP)
      - Mechanics & Structures (MS)
      - Space, Launchers & Satellites (ELS)

NOTE: Students must choose one option according to their major. They cannot mix courses from different majors and options.

NOTE: Some courses are taught in French, their description is accordingly.

Human Sciences and Languages common pole

Sh421 - Ethics for Engineers & Sustainable development
Sh422 - Sociologie des Entreprises & des Organisations
Sh423 - Droit social
FLEb - French language and Intercultural seminar

Corporate knowledge common pole

Mi421 - Qualité, Réglementation, Normes, Lean
Mi422 - Principes de Stratégies d'Entreprises
Mi423 - Economie : Gestion Financière

Engineering Sciences common core

Au421 - Graphic representation of dynamic multilinear system
Mi426 - Principes de base de Conception Avion et d'éco-conception - Industrialisation et Méthode de production
Aé421 - Flight Dynamics

Elective modules and Initiation to Research and Innovation

For EP, MS, SET, and SM students: subjects will be given at the beginning of the semester
For ELS students: Sp 421 - Fundamental astronomy, Astrometry
For ELS students: Sp422 - Astrophysics - General Astrophysics
Ci421a...r - Introducing Project to Research or Innovat ion (CIRI)

SYSTEMS Major
In421 - Complex Information Systems Modelling
In422 - Real Time Information Systems
In423 - Embedded Networks
Ma422 - Introduction to Machine Learning
Au425 - Physical Approach to aeronautical automated systems

VEHICLES Major
Mf421 - Fluid Dynamics
En421 - Energetics & Sustainable Design
Mé421 - Theory of plates & shells
Mé422 - Numerical calculations in mechanics and structures (FEM)

SYSTEMS Major - OPTION Embedded systems & Telecommunication (SET)
El421 - Advanced Applications of RPGA Circuits
In424 - Swarm Intelligent Systems
Té421 - Telecommunications: Principles & Bond Balance
Té422 - Guided Propagation & Hyperfrequencies

SYSTEMS Major - OPTION Mechatronic systems (SM)
Au424 - Power Electronics & Actuators in Aeronautics
Au422 - Guidance Principles of Autonomous Systems
Au423 - Introduction to Robotics
In424 - Swarm Intelligent Systems

SYSTEMS or VEHICLES Major - OPTION Space, Launchers & Satellites (ELS)
Sp423 - Space Mechanics
Sp424 - Project: Atmospheric Reentry & Mission Concept
Sp425 - Space Optics
Sp426 - Plasma physics, Electrical & Plasma Propulsion
Sp427 - Numerical Methods for Space Applications (COMSOL) - *VEH major only*

VEHICLES Major - OPTION Energetics & Propulsion (EP)
En422 - Turbomachine Design
En423 - Thermal Engines for Drone & Light Aircraft
En424 - Nuclear physics and nuclear rocket propulsion
En425 - Introduction to aeroacoustics

VEHICLES Major - OPTION Mechatronic & Structures (MS)
Mé424 - CAD: CATIA
Mé425 - Metallic & Composite Materials
Mé427 - Aircraft Structures Design
Mé423 - Advanced Materials

Course description

Human Sciences and Languages common pole

Sh421 - Ethics for Engineers & Sustainable development

La Responsabilité Sociétale des Entreprises est une obligation morale et intellectuelle qui, au-delà du cadre légal, met en pratique le respect des principes du développement durable (viabilité économique, bien-être de la société, protection de l'environnement). A ce titre, la démarche RSE interroge le business model de l'entreprise et le sens même de sa compétitivité, son devoir de vigilance lié aux impacts environnementaux et sociaux de ses activités. Ce cours expose les bénéfices de la RSE par une prise de conscience collective alliant nécessité de concrétiser l'éthique et volonté de prévenir les risques.

Sh422 - Sociologie des Entreprises & des Organisations

L'ensemble de ce cours doit permettre de comprendre le fonctionnement général d'une entreprise ou de toute autre forme d'organisation, en intégrant deux principes fondamentaux que sont la prise en compte des impératifs économiques actuels et le respect de l'éthique. L'accent est mis sur la notion de transversalité et d'interaction tant en ce qui concerne l'environnement que les contraintes propres à chaque organisation.

Sh423 - Droit social

Ce cours doit permettre aux élèves ingénieurs de comprendre les fondements et les bases du droit social pour leur activité professionnelle : des éléments de droit constitutionnel, d'organisation des institutions juridictionnelles (droit public et privé). Droits et devoirs (temps de travail, accident de travail...). Recours à l'intérim, au prêt de main-d'oeuvre, à la sous-traitance. Mode de calcul des salaires et des incidences diverses : déplacements, trajets, transports... Organisation du travail : temps de travail, heures normales et supplémentaires, différents congés, chômage. Contrôle du travail, rôle des principaux acteurs (formation continue, principes de la délégation de responsabilité, notions de responsabilité civile et pénale, sous-traitance, etc..).

FLEa- French as a foreign language (FLE)

This course will help students to learn the basics and more of French language in order to help them integrate into the IPSA student life as well as the daily life in Paris.

Corporate knowledge common pole

Mi421 - Qualité, Réglementation, Normes, Lean

Initier les étudiants à la connaissance des différents concepts et notions de base du management de la qualité rencontrés dans les principales branches professionnelles de l'industrie et des services.
Mieux comprendre ce qu'est une démarche qualité, de diffuser la culture, l'esprit Qualité. Initier les étudiants à la réglementation aéronautique.

Mi422 - Principes de Stratégie d'Entreprise

Analyser la typologie des objectifs stratégiques des entreprises afin de comprendre leur diversité et leur cohérence.
Analyser les modèles d'analyse stratégique des entreprises.
Etre en mesure d'analyser les choix stratégiques des entreprises par des études de cas

Mi423 - Economie : Gestion Financière

Etre en mesure d'effectuer un diagnostic financier afin de distinguer les forces et faiblesses d'une entreprise

Analyser les différentes notions de rentabilité d'une entreprise et leurs déterminants. Etre en mesure de relier ceux-ci aux choix stratégiques effectués par une entreprise.

Analyser et appliquer les critères de sélection des projets d'investissement.

Engineering Sciences common core

Au421 - Graphic representation of dynamic multilinear system

At the end of this course, the student must:

- have effectively acquired the method that allows him to understand, through "bond graph" modeling, the functioning and optimization of mechatronic and therefore multi-physical systems
- have acquired autonomy in the analysis of multi-domain systems (mechanical, hydraulic, electrical, pneumatic, etc.)
- Be able to make complete and multi-physical system models

Prerequisites: Knowledge of automation, mechanics, hydraulics, electrical engineering

Mi426 - Principes de base de conception Avion et d'éco-conception - Industrialisation et Méthode de production

At the end of this course, students must be able to:

- Understand the basic principles of aircraft design.
- Integrate the objectives and constraints of eco-design.
- Master the main principles of industrialization and the main production methods.

Aé421 - Flight Dynamics

The main objective of this course is to understand aircraft configuration aerodynamics, performance, stability and control. This course allows student to estimate an aircraft’s aerodynamic characteristics from

geometric and inertial properties. At the end of this course, the student should be able to analyze linear and nonlinear dynamic systems, recognize airplane modes of longitudinal and lateral motion and their significance, and knowing what to do for making the airplane more stable, and answering to flying qualities criteria.

Prerequisites: knowledge in aeronautics

Elective modules and Initiation to Research and Innovation

Sp 421 - Fundamental astronomy, Astrometry

The students will learn all thematics of the fundamental astronomy: observation, space-time reference systems, and reference frames. They will see the different mechanisms of observation and positioning in space.

Sp422 - Astrophysics - General Astrophysics

The students will see all thematics and sciences of the Universe. They will learn details of its components, and the formation processes of the big objects : stars, planetary systems, galaxies, nebula, and dark holes.

Ci421a...r - Introducing Project to Research or Innovation (CIRI)

The objective of this course is to introduce engineering students to research and train them in innovation through research by offering a range of Master's level courses that cover the different disciplines covered during the IPSA curriculum, such as automation, optimization and its applications, energetics, aerodynamics, structural and fluid mechanics, engineering ethics and applied mathematics. The skills targeted are in the order of the methodology of scientific research work (including motivation, inductive approach, bibliographic research, rigour and autonomy), teamwork, the development of a critical and innovative spirit, and the exercise of oral communication on technical work.

SYSTEMS Major

In421 - Complex Information Systems Modelling

Model Based Engineering (MBE) is an engineering method dedicated to complex systems. This course introduces students on how to produce and use models on the different steps of a system life cycle. Students will learn different kind of models used to represent static and dynamic behaviours, global and detailled aspects of a system with UML.
Prerequisites: Object-Oriented programming

In422 - Real Time Information Systems

The focus of this course is to familiarize students with real time systems. Several real time algorithms will be studied and compared with each other. During the practical work, students will need to program in C/C++ to manage real time algorithms.
Prerequisites: C/C++ skills, personal computer with gcc compiler

In423 - Embedded Networks

This course is dedicated to the study and production of applications for digital communications. Students will learn how to produce client and server applications to exchange data or data stream using different network protocols. This course is mainly based on practical works using berkley api and python programming language.
Prerequisites: Basic concepts of digital networks (i.e. the OSI architecture) – Basic concept of programming – nb: knowledge of the python programming language is not required but recommended

Ma422 - Introduction to Machine Learning

This class yields a general introduction to machine learning, statistical pattern recognition and data mining Some of the subjects covered in the course include: supervised learning (linear and logistic regression, neural networks and support vector machines), good practices for model selection and unsupervised learning (clustering, dimensionality reduction). The course will also examine numerous case studies and applications, so that you will also learn how to apply and implement theselearning algorithms.
Prerequisites : Elementary statistics, basic notions in probabilities, good programming skills.

Au425 - Physical Approach to aeronautical automated systems

At the end of this course, the student must :
- know the practical aspect of the control and its implementation on ECUs
- be able to synthesize while respecting the stability and precision performances imposed by a set of specifications.

Prerequisites : Programming of microcontrollers

VEHICLES Major

Mf421 - Fluid Dynamics

Objectives of the course:
- Understand the phenomena related to fluid dynamics
- Master the fundamental equations
- Solve fluid dynamics problems
- Build and interpret digital models

Prerequisites: Fluid mechanics , Mechanics of continuous fluids

En421 - Energetics & Sustainable Design

Acquire notions in terms of national and international energy balances (who consumes what? In what proportions? How?). Acquire knowledge on the reduction of energy reserves. Become familiar with the concepts of global warming. Understand the implications of using new energies. Understand the (simple) modelling of physical phenomena related to the greenhouse effect. Acquire basic knowledge of the physical phenomena involved in renewable energy technologies. Understand how this type of technology works.
Prerequisites: Thermodynamics, Physical Energy, Thermal Transfers

Mé421 - Theory of plates & shells

At the end of this course, students:
- Will have a detailed knowledge of the mechanics of continuous media in the elastic field for plates and shells,
- Master the determination of the different characteristics of the latter and the consequences in design.
- Will be able to exercise judgment in making choices to meet a need.

Prerequisites: Aeronautics - General mechanics - Material resistance

Mé422 - Numerical calculations in mechanics and structures (FEM)

This courses is intended to be an overview Finite Element Analysis using Patran and Nastran. The three types of elements below will be studied:
- One dimensional elements: 1D beam elements are used to model long, slender structural members...
- Two dimensional elements: 2D plate elements are used to model thin structural members such as aircraft fuselage skin or car body
- Three dimensional elements: 3D solid elements are used to model thick components such as the piston head

The problems studied are are: Static calculation of elastic structures: Eigenfrequencies problem
Prerequisites: Finite elements (theoretical part) - Strength of materials - Mechanics of continuous fluids - Mathematics

SYSTEMS Major - OPTION Embedded systems & Telecommunication (SET)

El421 - Advanced Applications of RPGA Circuits

The aim of this course is to implement a sequential circuits (Flip-flop, clock divider) using VHDL language. In addition, the students will learn how to design a state machine (i.e. traffic light) and a VGA controller to display something on a monitor using FPGA Board.
Prerequisites: FPGA circuit basics, VHDL, digital electronics.

In424 - Swarm Intelligent Systems

This course introduces some basic notions of artificial intelligence. It mainly focus on the notion of task planning and how the machine is reasoning to produce a plan dealing with temporal constraints. At the end of the course, we will implement a planning system into a wheeled robot.
Prerequisites: C/C++ skills, Arduino + Gnuplot platform.

Té421 - Telecommunications: Principles & Bond Balance

At the end of this course, the student must:
- Know the mathematical tools used in signal expression and the different types of modulations commonly used.
- Have an understanding of the basic models used to characterize the architecture and performance of a telecommunications system.
- Be able to characterize a transmission by these different parameters in terms of transmission link..

Prerequisites: Fourier Transform, electromagnetism, and general aeronautical telecommunication systems

Té422 - Guided Propagation & Hyperfrequencies

In this lecture, we will describe the theoretical models for the analysis of wave propagation along different forms (coaxial, microstrip...) and classification (TEM, TE...) of transmission lines. The reflected waves and the standing waves will also descript. Smith chart and its performances in microwave circuit analysis and transmission lines adaptation.
Prerequisites: The students must have knowledge on: Mathematics for Engineers, Physics, Electromagnetic Field, Electric Circuits, Electrical Drives, and Transmission Lines.

SYSTEMS Major - OPTION Mechatronic systems (SM)

Au424 - Power Electronics & Actuators in Aeronautics

Contents of the course: Aircraft electrical system. Electrical actuators. Aircraft hydraulic and pneumatic systems. Hydraulic actuators. Lab session on modelling and control of electrohydrostatic actuators (EHA) and electro-mechanical actuators (EMA).
Prerequisites: Applied control (AU412), Multidomain physical modelling (AU411)

Au422 - Guidance Principles of Autonomous Systems

The aim of the course focuses on poviding theoretical (and partially experimental) background to address navigation and guidance (N&G) strategies used for autonomous systems. In this course we will study different navigation strategies for aerial and terrestrial vehicles. The principles discussed in the actual course and especially the passage from theory to practice will be implemented on a demonstrator designed by IPSA.

Au423 - Introduction to Robotics

At the end of this course, the student must:
- be familiar with the principles of robotics and the organization of a robotics system from the point of view of its control and also from the point of view of its architecture.
- have understood the technological principles of the main components of industrial robots.
- be able to carry out the geometric and kinematic modelling of an industrial robot (openchain series).

Prerequisites: Applied control (AU412), Matlab/Simulink

In424 - Swarm Intelligent Systems

This course introduces some basic notions of artificial intelligence. It mainly focus on the notion of task planning and how the machine is reasoning to produce a plan dealing with temporal constraints. At the end of the course, we will implement a planning system into a wheeled robot.
Prerequisites: C/C++ skills, personal computer with Arduino + Gnuplot platform.

SYSTEMS or VEHICLES Major - OPTION Space, Launchers & Satellites (ELS)

Sp423 - Space Mechanics

The students will see all aspects of the spatial mechanics, from the non-disturbed keplerian motion to the disturbed one. They will be able to use all informations for orbital applications and spacecraft missions.
Prerequisites: Introduction to Space Systems, General Physics, General Mechanics, Digital Analysis

Sp424 - Project: Atmospheric Reentry & Mission Concept

At the end of this course, the student must:
- Master the basic concepts (trajectography, rapid assessment of hypersonic aerodynamic coefficients for complex vehicles, hypersonic aerodynamic constraints, thermal response of protective materials, etc.) to design a feasibility analysis of the atmospheric re-entry/entry component of a space mission.
- Know how to evaluate orders of magnitude.
- Design and produce a feasibility report on the atmospheric re-entry/entry component of a space mission.

Prerequisites : Programming in MatLab and thermodynamics.

Sp425 - Space Optics

At the end of this course, students:
Know the basics of passive optronic sensors that combine optics and detection.
Know the different techniques used.
Have an understanding of the operating procedures and technical characteristics of this equipment.
Will be able, at the technical level, to interpret the results of observations.

Sp426 - Plasma physics, Electrical & Plasma Propulsion

The first part concerning the plasma theory and in particular: the characteristic parameters of a plasma, the industrial and natural plasmas and their differences, the different descriptions of a plasma (particulate, kinetic and fluid), the phenomena of transport and confinement of plasmas, the generation of discharge plasmas, used for electric propulsion for space, some notions in propagations of waves in a plasma. The second part concerns the study of plasma flows during the phenomenon of atmospheric reentry of probes for example, study of radiation phenomena and ablation.
Prerequisites : fluid mechanics, electromagnetism, thermodynamics and heat transfer, a little statistical physics and atomic and molecular physics, notions of quantum mechanics and wave physics.

Sp427 - Numerical Methods for Space Applications (COMSOL) - *VEH major only*

Complex systems are governed by physical and mathematical laws. Their modelling requires complex equations to be solved by numerical methods. The course proposes to give an overview of numerical methods for space applications. We will see in particular methods of numerical integration, inversion, least squares, etc.

VEHICLES Major - OPTION Energetics & Propulsion (EP)

En422 - Turbomachine Design

The objective of this course is to:
To understand thermodynamic cycle calculations and performance in adaptation and nonadaptation as well as the laws of regulation of turbomachines.
To understand the physical phenomena and design criteria of the compressor and turbine components of a turbomachine.
Present the main types of tests carried out to develop and qualify an aeronautical turbomachinery.
To train students in critical thinking through guided design work using simplified tools.
Prerequisites: Thermodynamics applied to turbomachinery , Aerodynamics of flows and profiles, Beam mechanics - Vibration mechanics, Thermal exchanges, Mathematics associated with these modules.

En423 - Thermal Engines for Drone & Light Aircraft

This class allows students to be familiar with thermal engines. They will particularly work on engines design and energetic performances optimization (concerning efficiency, effective mechanical work...). They will perform their studies in team projects.
Prerequisites: Thermodynamics, Thermal Transfers, Applied Thermodynamics.

En424 - Nuclear physics and nuclear rocket propulsion

Chemical rockets are already approaching their theoretical limits. Various ways of utilizing nuclear reactions for rocket propulsion have been suggested, some of which have been tested on earth. The aim of these lectures is to provide the main knowledges of nuclear physics and their advantages on thermal nuclear propulsion. We start from the basics of nuclear physics to more speci c aspects of nuclear engineering and thermal rocket propulsion.
Prerequisites: General physics, electromagnetism, thermodynamics, basics of quantum or nuclear physics (not required)

En425 - Introduction to aeroacoustics

Through these lectures, students will be introduced to the main basics of acoustics and aeroacoustics starting from the sound wave equation in free field and the expression of the speed of sound in different fluids. We derive the wave equation from linearised Navier-Stokes equations and introduce the Lighthill's tensor for the first time in this frame. Helmholtz resonators will be studied along with other applications on aircraft sound insulation.

VEHICLES Major - OPTION Mechatronic & Structures (MS)

Mé424 - CAD: CATIA

At the end of this course, the student :
- will be able to model in 3D a family of parts in solid or surface mode;
- will be able to model in 3D a family of assemblies composed of about ten parts;
- will be able to structure and share tasks related to the 3D modeling of a simple generic product, in the case of a small work team.

Prerequisites: knowledge of CAD

Mé425 - Metallic & Composite Materials

The objective of this course is to give knowledge about aeronautical materials.
This course presents metallic and composite materials used in aeronautical structures.
It gives their main characteristics and behaviours: Static strength, Fatigue Testing aspects and airworthiness requirements are introduced and detailed continuously through the course.
Prerequisites: Background in general mechanics and aeronautical context

Mé427 - Aircraft Structures Design

The objective of this course is to give an initiation to aircraft structural design.
This course provides with methods for stress analysis and sizing.
The main topics are:
Wing Box Structural Design : architectures – stress analysis and sizing
Fuselage Structural Design: architectures – stress analysis and sizing
Testing aspects and airworthiness requirements are introduced and detailed continuously through the course.
Prerequisites: Background in material sciences and beam and shell theory.

Mé423 - Advanced Materials

The study of the mechanical behaviour of materials aims to know their response to a given solicitation. The state variables involved in this domain are stress tensor and strain tensor. The objective of this course is to give a general overview of the mechanical behaviour of materials, and its modelling. Indeed, while linear elasticity currently represents the framework for the majority of continuous-cycle mechanical calculations carried out in industry, other types of behaviour are increasingly used because they are closer to reality, and thus allow a more strict dimensioning of structures or certain processes.
Prerequisites: MMC, Computation on Structural materials.

Second year of Master
(Aero 5)

Fall semester

The fall semester of the second year of master (Aero 5) includes:

- Human Sciences and Languages common pole focusing on Societal Issues and Ethics in Engineering
- Corporate knowledge common pole focusing on Contract Law and Corporate Strategy
- IPSA Project Master (PMI) : a project intended to develop initiative, autonomy and the ability to manage priorities
- 3 majors: VEHICLES (VEH), SYSTEMS (SYS) and MANAGEMENT (MLI)
- 8 options - 3 for SYSTEMS, 3 for VEHICLES and 2 for MANAGEMENT
    - SYSTEMS major: 4 options
      - Autonomous Airborne Systems Control (SAA)
      - Operation & Transmission of Embedded Information (TIE)
      - Space, Launchers & Satellites (ELS)
    - VEHICLES major: 3 options
      - Airframe & Materials (CAE)
      - Energetics & Engines (EMO)
      - Space, Launchers & Satellites (ELS)
    - MANAGEMENT major: 2 options - fully taught in French
      - Management des projets industriels (MPI)
      - Management de la production et du MCO (MPM)

NOTE: Students must choose one option according to their major. They cannot mix courses from different majors and options.

NOTE: Some courses are taught in French, their description is accordingly.

Human Sciences and Languages common pole
Sh511 - Enjeux sociétaux
Sh512 - Facteurs humains et interaction Homme-Machine analyse sécurité des vols
FLEa - French language and Intercultural seminar

Corporate knowledge common pole
Sh515 - Droit social
St511 - Connaissance et insertion milieu industriel
Mi516 - Sûreté de fonctionnement : Méthodologie AMDEC
In519 - Initiation à la cybersécurité
Mi511 - Stratégie d'entreprise - Etude de cas
Mi517 - Outil de gestion-certification (Excel- TOSA et VBA)

Pm 511 - IPSA Project Master

SYSTEMS Major
Au511 - Aircraft Modeling & Autopilot
Au512 - Identification & Obeservation of systems
Ma512 - Deep Neural Network & Deep Learning
Au513 - Systems Design & Fast Prototyping

VEHICLES Major
Mf511 - Introduction to Hypersonic Aerodynamics
Mé511 - Vibration Dynamics of Plates & Shells
Mé512 - Reliability & fatigue of structures
Mé513 - Calculation of ground and flight loads
Mf512 - Computational Fluid Dynamics (CFD)

MANAGEMENT Major
Mi513a - Achats & relations fournisseurs
Mi513b - Management des coûts
Mi512 - Code de la commande publique
Mi513d - Outil de gestion de projet (MS Project)
Mi513e - Gestion financière
Mi513f - Finance appliquée au secteur aéronautique - étude de cas
Mi513g - Integrated Logistic Support & Integrated In service Support (MCO)

SYSTEMS Major - OPTION Autonomous Airborne Systems Control (SAA)
In511 - Intelligent Controls
Au514 - Nonlinear systems control
In512 - Distributed Intelligent Systems
Au515 - Drones & Visual Servoing
Au516 - Project : Dynamic Planning of Autonomous navigation

SYSTEMS Major - OPTION Operation & Transmission of Embedded Information (TIE)
In513 - Embedded Real - time Operating Systems
El511 - Embedded systems: Image processing with FPGA
In518 - High Performance Computing on GPU
Te511 - EM Compatibili ty & Antennas
Te513 - Cursus project: Programming of advanced neural networks on FPGA or GPU
Te514 - Airborne Sensors & Data Transmission

SYSTEMS or VEHICLES Major - OPTION Space, Launchers & Satellites (ELS)
En513 - Space Propulsion Systems
En515 - Electric & nuclear Propulsion for aircraft
Sp511 - Satellites Design
Sp512 - Launchers Design
Sp513 - Payload Integration & Launchers
Sp514 - Cursus Project : Conception of a Space Mission II
Sp515 - Space telecommunications - ELSS
Sp516 - Space telecommunications - ELSS applications

VEHICLES Major - OPTION Airframe & Materials (CAE)
Aé513 - Vertical Flight
Mé514 - Multi-body Mechanical Simulation
Mé515 - Calculation in Structural Materials
Mé516 - Durability of Advanced Materials
Mé517 - Nonlinear Numerical Simulation in Structural Mechanics
Mé518 - Cursus project: Finite Element Method for Structures Calculation

VEHICLES Major - OPTION Energetics & Engines (EMO)
En511 - Cursus project: Turbomachinery enhancement and design projet for a turbojet engine
En512 - Combustion
En513 - Space Propulsion Systems
En514 - Analytical & numerical calculations in heat transfer
Mf514 - Aeroacoustics
Mf515 - Turbulence

MANAGEMENT Major - OPTION Management des projets industriels (MPI)
Mi514a - Négociations internationales
Mi514b - Contrôle de gestion
Mi514c - Evaluation financière des projets
Mi514d - Analyse de la performance commerciale
Mi514i - Challenge "négociations commerciales"
Mi514e - Analyse et gestion des risques des projets industriels
Mi514f - Financement des projets industriels
Mi514g - Réponse à appel d'offres
Mi514h - Simulation informatisée à la gestion d'entreprise

MANAGEMENT Major - OPTION Management de la production et du MCO (MPM)
Mi515a - Journée Etude de cas SLI
Mi515b - Approvisionnement et gestion des stocks
Mi515c - Techniques de gestion de la Qualité
Mi515d - Supply chain (approfondissement)
Mi515e - Contrôle de gestion de la production
Mi515f - Cycle de vie des produits - Gestion de configuration
Mi515g - Après-vente - Maintenance : Navigabilité et MCO
Mi515h - Projet compagnie aérienne

Course description

Human Sciences and Languages common pole

Sh511 - Enjeux sociétaux

Par la connaissance des réflexions les plus récentes en sciences humaines, les élèves ingénieurs sont invités à prendre part à des controverses et à des débats mettant en jeu le lien entre leur futur métier et la société dans laquelle ils évolueront.
La mise en commun des projets industriels actuels doit permettre de dresser un panorama des biens et services imaginés par les ingénieurs (ou attendus par leurs bénéficiaires). Devant ces perspectives techniques et scientifiques, une vision de la société de demain s'esquisse et nous interroge : quels seront les effets produits par l'introduction de nouvelles technologies sur les rythmes de vie, la cohésion sociale, la culture d'un peuple, etc.. ?

Sh512 - Facteurs humains et interaction Homme-Machine analyse sécurité des vols

A l'issu de cet enseignement, les étudiants auront compris au travers de l'analyse d'accidents aériens, de leurs causes, et des risques spécifiques aux différentes phases du vol :
- L'importance de la prise en compte du facteur humain dans la maîtrise des risques, et de ses conséquences générales sur la conception ;
- Plus spécifiquement l'importance de la prise en compte du facteur humain dans la conception de l'interface Homme-Machine.

FLEa- French as a foreign language (FLE)

This course will help students to learn the basics and more of French language in order to help them integrate into the IPSA student life as well as the daily life in Paris.

Corporate knowledge common pole

Sh515 - Droit social

Ce cours doit permettre aux élèves ingénieurs de comprendre les fondements et les bases du droit social pour leur activité professionnelle : des éléments de droit constitutionnel, d'organisation des institutions juridictionnelles (droit public et privé). Droits et devoirs (temps de travail, accident de travail...). Recours à l'intérim, au prêt de maind'oeuvre, à la sous-traitance. Mode de calcul des salaires et des incidences diverses : déplacements, trajets, transports... Organisation du travail : temps de travail, heures normales et supplémentaires, différents congés, chômage. Contrôle du travail, rôle des principaux acteurs (formation continue, principes de la délégation de responsabilité, notions de responsabilité civile et pénale, sous-traitance, etc..).

St511 - Connaissance et insertion milieu industriel

At the end of this course, the student must:
- Master the techniques of pitching and managing a job interview: presentation, most frequently asked questions, time management, questions to ask
- Master the main points and argumentation of a salary negotiation (argumentation on his profile, his advantages in relation to the offer and his expectations, as well as in relation to the market).
- Master networking techniques.

Mi516 - Sûreté de fonctionnement : Méthodologie AMDEC

Connaissance générale des domaines de la sureté de fonctionnement.

In519 - Initiation à la cybersécurité

The objective of this cours is to acquire the basics of cybersecurity and understand how it works through demonstrations. Several vocabulary and concepts of the field will be introduced. Then, the students will have an introduction to different types of cyber attacks

Mi511 - Stratégie d'entreprise - Etude de cas

Ce cours vise à permettre aux étudiants de maîtriser les différents outils de l'analyse stratégique.
La maîtrise de ceux-ci permet d'analyser les choix stratégiques des entreprises en fonction de leurs objectifs et environnement.

Mi517 - Outil de gestion-certification (Excel- TOSA et VBA)

Approfondir ses connaissances des nombreuses utilisations du tableur Excel
- Mieux maitriser les différentes fonctionnalités d'Excel
- Savoir manipuler les graphiques et les tableaux croisés dynamiques et les fonctions de recherche afin d'analyser des bases de données. Maitriser les fonctions financières et matricielles. Appréhender le langage Visual Basic et créer des macros et fonctions.

Pm 511 - IPSA Project Master

At the end of this project, the student must be able to:
- conduct research work in teams of two or three people using a rational project management approach;
- search for references on the subject (in a library, on the Internet or on any other media);
- conduct a thorough general theoretical study based on the knowledge acquired
- prepare a report presenting the objectives of the project, the approach followed, the theoretical study, the implementation and the results obtained
- present the subject orally before a jury

SYSTEMS Major

Au511 - Aircraft Modeling & Autopilot

At the end of this course, the students:
Will be able to apply the theoretical concepts developed in the course on 'fundamental automation' to formalize the behaviour of an aerospace vehicle.
Will be able to find the roots of performance through the examination of the results through time.
They will be able to use the MATLAB / SIMULINK analysis and synthesis tools for system design and analysis.
They will have understood the methods and requirements for the sequencing of a complex project.
Prerequisites: Automotion courses and Mechanics of flight courses

Au512 - Identification & Obeservation of systems

Identification and Observers, particularly Kalman filters, are major topics for engineers. The aim is to estimate the parameters or the internal variables (states) of a physical system by only using experimental input and output measurements. Attitude estimation of an aerial object with Extended Kalman Filter is taken as a case study.

Prerequisites: Matlab/Simulink, Introduction de control systems (AU41), Digital control systems, Introduction to state space control (AU43), preferably Applied control (AU412)

Ma512 - Deep Neural Network & Deep Learning

At the end of this course, the student must:

- Know the most common methods in deep neural networks.
- Understand the mechanisms underlying the performance of deep learning approaches,

-Approach many case studies and applications, so that it also learns to apply and implement these learning algorithms.

Au513 - Systems Design & Fast Prototyping

The course focuses on the design of the embedded part of a mechatronic system; At the end of the course, the student:

• Will have understood the principle of designing and building a mechatronic system.

• Will be familiar with the concepts of Model-Based-Design and the Cycle V design approach

• Will be able to develop, based on specifications, control laws and embedded codes using multi-domain physical modelling tools and rapid prototyping.

Prerequisites: Automation modules, mechatronics, electronics modules, embedded systems, programmable logic.

VEHICLES Major

Mf511 - Introduction to Hypersonic Aerodynamics

At the end of this course, the student will:

- have learned the generalities on high speed flows
- know the effects of large MACH numbers on flows of the moving fluid.
- be able to determine the characteristics of a normal shock, oblique shock and curvilinear shock
- be able to analyze the characteristics of a hypersonic flow behind thin partitions.

Prerequisites: Subsonic and supersonic aerodynamics course. ‘Mechanics of flight’ course.

Mé511 - Vibration Dynamics of Plates & Shells

At the end of this course, students:

- We know perfectly the basic principles of vibration mechanics and the vibrational behaviour of solids and structures
- Master the determination of the different characteristics of these and the consequences in design.
- Will be able to exercise judgment in making choices to meet a need.

Prerequisites : Aeronautics - General mechanics - Material resistance

Mé512 - Reliability & fatigue of structures

The purpose of this course is to provide with methods and tools to take into account uncertainties in aircraft structures, especially in aircraft fatigue.
Structural analysis require the consideration of several sources of uncertainties [material and load uncertainties for instance].
Basic approaches, generally deterministic, are often applied because of their simplicity, but sometime criticized when the results are found unrealistically severe. Actually these deterministic approaches are often not adapted to take into account uncertainties with accuracy.
Reliability approaches enable to take into account uncertainties with an adequate accuracy and provide with and optimized and acceptable level of safety. The reliability methods are applied to Aircraft Fatigue domain.
Prerequisites : Background in probability and statistic methods. Background in material sciences.

Mé513 - Calculation of ground and flight loads

The objective of this course is to give an initiation to aircraft loads.
This course provides with fundamental knowledge about aircraft load analysis.
The 3 mains topics are: Flight loads, Ground loads and Crash loads.
Testing aspects and airworthiness requirements are introduced and detailed continuously through the course.
Prerequisites: Background in aerodynamics and flight mechanics..

Mf512- Computational Fluid Dynamics (CFD)

At the end of this project the student will:
- be familiar with the interface and logic of a digital tool for solving a fluid mechanics problem: Starccm +
- be able to analyze an aerodynamic problem and to model it with 'Starccm +'software
- be able to construct the geometry of its problem, to define the boundary conditions, the mesh as well as the various other physical parameters of the problem to be processed
- be able to represent the numerical results and to analyze them. - Will be able to carry out more complex aerodynamic modelling problems.

Prerequisites: Course in 'Fluid Mechanics'. Knowledge of the Starccm+ software

MANAGEMENT Major

Mi513a - Achats & relations fournisseurs

A l'issue de ce cours, l'étudiant doit :
- Être capable de réaliser une analyse de besoin d'achats,
- Être capable de réaliser une analyse de marché fournisseurs,
- Être capable de réaliser des analyses de coûts d'achats et définir des objectifs de prix d'achats.
- Être capable de construire et déployer des stratégies d'achats,
- Etre capable de préparer et réaliser des négociations d'achats avec des fournisseurs

Mi513b - Management des coûts

Initier les étudiants aux procédures de la commande publique :
- Présentation des sources internationales, européennes et nationales du droit de la commande publique,
- Les procédures de passation des marchés publics,
- Sélection des candidatures et des offres dans les marchés publics,
- Modifications des marchés publics,
- Les aspects financiers et comptables des marchés publics,
- Le contentieux de la passation et l'exécution des marchés publics (voies de recours),
- Les délits associés à la commande publique.

Mi512 - Code de la Commande Publique

Ce module de Management des coûts doit permettre aux étudiants de comprendre et maîtriser les principales méthodes de détermination et d'analyse des coûts (Coûts complets et partiels). Ce module de Management des coûts doit permettre aux étudiants doit permettre aux étudiants de comprendre l'élaboration de devis et de réponses à des appels d'offre.

Mi513d - Outil de gestion de projet (MS Project)

Ce module doit permettre la maîtrise du logiciel MS Project dans la cadre de la conduite de projets.

Mi513e - Gestion financière

Ce module de Gestion Financière doit permettre à l'étudiant de savoir analyser les principaux enjeux de l'analyse financière : La rentabilité, le financement de l'activité, les choix de projets d'investissement.

Mi513f - Finance appliquée au secteur aéronautique - Etude de cas

Ce module de Finance Appliquée au secteur aéronautique doit permettre de mettre en application différentes techniques et concepts présentés en cours de Gestion Financière. Il doit permettre la maîtrise certaines techniques financières fréquemment utilisées par les constructeurs aéronautiques et/ou les compagnies aériennes.

Mi513g - Integrated Logistic Support & Integrated in service support (MCO)

Objectifs:
- Une vision des activités de support et de soutien d'un aéronef et de ses équipements tout au long du cycle de vie.
- Une connaissance des principaux leviers d'optimisation pour chacun des grands processus (SLI, gestion de flotte, maintenance et supply chain)
- La connaissance des principaux outils numériques (ERP, SGM, IA, ...)

SYSTEMS Major - OPTION Autonomous Airborne Systems Control (SAA)

In511 - Intelligent Controls

At the end of this course, the student must:
1. Master the concepts of learning in computer systems.
2. Master the command of a robot.
3. Be able to design and implement, a learning approach on the control of a mobile robot in a stable environment

Prerequisites: Good knowledge of the programming language, for practical work.

In512 - Distributed Intelligent Systems

Manipulate the concepts of modelling with multi-agents systems. Understand the notion of Artificial Intelligence and why do we need distributed systems. Be able to implement an autonomous robot for obstacle avoidance. Learn how to program all the major systems of a robotic system for autonomous driving cars. This class will teach you basic methods in Artificial Intelligence, including: probabilistic inference, planning and search, localization, tracking and control, all with a focus on robotics. Extensive programming examples and assignments will apply these methods in the context of building self-driving cars

Prerequisites: Knowledge about Artificial intelligence

Au514 - Nonlinear systems control

The objective of the course is to provide an overview on the techniques of analysis and control of non-linear systems. Most systems (mechanical, aeronautical, chemical, etc.) involve phenomena of the non-linear type, therefore its analysis is based on different control techniques. The course will provide an introduction on the most classical analytical tools to determine the behaviour of a nonlinear system using a description in terms of
differential equations.

Au515 - Drones & Visual Servoing

At the end of this course, the student:
1. Know the basics of image processing
2. Will be able to manipulate images and apply basic image processing algorithms (edge detection, image enhancement, noise reduction)
3. Will be able to follow the courses of image processing of higher levels (Fourier transform, mathematical morphology, image compression)

Au516 - Project: Dynamic Planning of Autonomous navigation

During this project students will study and understand the control and the use of some techniques of AI into a robotic platform.

SYSTEMS Major - OPTION Operation & Transmission of Embedded Information (TIE)

In513 - Embedded Real-time Operating Systems

After an introduction to hard, soft, strict and certificable real-time systems, students will learn how to use linux for real-time application. The course will explore the linux operating system, how it could be setup for real-time and how to produce real-time applications using C/C++ programming language.
Prerequisites: Basic concepts of system programming : processes, threads, signals, etc...

El511 - Embedded systems: Image processing with FPGA

Image processing is a growing field with tremendous potential and scope for development. With the advent of advanced visual technologies, there is a need to have an ultra high speed processing devices to match the quality of the high definition domain. An optimum architecture can be developed by prototyping it on a reconfigurable device (FPGA). This course deals with the design and implementation of an image processing using an FPGA Board. The expected and achieved outputs will be compared to standard MATLAB outputs.

In518 - High Performance Computing

During this course, the student need to:
- Understand the fundamental programming techniques for high performance computer architectures
- Be able to design, implement and benchmark parallel programs on shared-memory and distributed-memory systems.

Prerequisites: Good knowledge of programming languages (Python, Java, C, or C++).

Te511 - EM Compatibility & Antennas

The course is divided in two parts, the first consist to study the Antennas. The Antennas are basic components of any electric system and are connecting links between the transmitter and free space or free space and the receiver. Thus antennas play very important role in finding the characteristics of the system in which antennas are employed. Antennas are employed in different systems in different forms.

The second part of the course provides basic understanding of how electromagnetic disturbances appear in, propagate and influence electromagnetic components and systems.

Also the methods and strategies that reduce the influence of disturbances will be studied.

Prerequisites: Mathematics for Engineers, Physics, Electromagnetic Field, Electric Circuits, Analog and Digital Electronics, Electrical Drives and Transmission Lines.

Te513 - Cursus project

During this project students will study and understand the concept of communication between two or several systems using different types of telecommunication technics.

Te514 - Airborne Sensors & Data Transmission

After this course, the student will:

1. master mathematical tools and basic models to characterize and define the architecture and performance of a wireless sensor network (WSN) system.

2.understand the different routing protocols and synchronization of sensors

3. be able to evaluate the performance and relevance of the use of different architecture

SYSTEMS or VEHICLES Major - OPTION Space, Launchers & Satellites (ELS)

En513 - Space Propulsion Systems

To introduce students to the architecture of propulsion systems for space launchers, Master the important parameters of these systems, To be able to dimension this type of propulsion system using simple methods and to estimate the performances. To know the basics of the technology of these engines.

Prerequisites: Thermodynamics (In 21a and b) - Thermal Transfers (in 31), Applied Thermodynamics In 32b)

En515 - Electric & Nuclear Propulsion for Aircraft

This module allows students to familiarize themselves with plasma physics and its fundamental concepts while emphasizing those that will be useful to the understanding of electric propulsion. In the first part of the module, after comparing with chemical propulsion, the principle of electrical propulsion and the fundamental laws that describe the plasma state and its physics are presented. The second part of the module focuses on electrical propulsion and its advantages over chemical propulsion. This module stimulates reflexion in students in the face of tomorrow's major challenges by proposing a model of propulsion that already works and trying to question the future of this technology.

Prerequisites: Electromagnetism,Wave Physics, Fluid Mechanics.

Sp511 - Satellites Design

Provide students with basic elements of satellite design.
Know all the subsystems that make up a satellite
To know the orders of magnitude and to know how to make a preliminary dimensioning of some subsystems.
Prerequisites : space mechanic, thermic, electricity, automatic

Sp512 - Launchers Design

At the end of this course, the student will:
- be able to understand the problems of the design of the launchers
- know the basic principles of space mechanics
- know the different technical fields that come into play in the Calculation of trajectories.
- be able to put into practice the theoretical principles to design a launcher

Prerequisites: Space mechanics course

Sp513 - Payload Integration & Launchers

At the end of this course, the student must:
- To know the constraints related to mechanical, thermal and electromagnetic environments applicable to a satellite during a launch on Ariane 5, Soyuz and Vega
-To know the different methods of demonstrating the qualification of a satellite for these environments
- To know the processes applied by the sector's industrialists in the management of derogations and anomalies
- To know the competitive environment facing European launchers

Sp514 - Project: Conception of a Space Mission II

At this end of this course, the student:
- Should know the different elements of a spatial mission
- Should be familiar wiht the preparation and the development of a mission
- Should know how to elaborate the mission scenario and identify critical steps
- Should know the specificities of a mission base on nano and micro satellites
- Should have basic knowledge on economic and strategic issues about spatial missions.

Prerequisites: Space mechanics, Satellite design (Sp 551), Space propulsion systems (In 504), Launcher design (Sp552)

Sp515 - Space telecommunications - ELSS

At the end of this course, the student must
- Know the main components of a digital telecommunications chain as well as the architectures of the main current telecommunications systems.
- Understand the principles governing the implementation of different technologies and the perspectives in which each one fits.
- To be able to understand their respective contribution to overall performance (example of a complex system) and to mobilize resources from the field of fundamental sciences to calculate the performance of a telecommunications system.

VEHICLES Major - OPTION Airframe & Materials (CAE)

Aé513 - Vertical Flight

To understand vertical flights and acquire knowledges on helicopters' technologies, aerodynamic principles, rotor's mechanic, etc.
Prerequisites : Aerodynamics

Mé514 - Multi-body Mechanical Simulation

To use a software of multi-body mechanical simulation and apply it to SimDesigner Motion (and CATIA V5).

Prerequisites: vibrational dynamics, CAD, solid mechanics.

Mé515 - Calculation in Structural Materials

At this end of this course, the student:

- Should have general knowledge about composite materials and on their performances
- Should have the basis and tools used for composite structures sizing
- Should have basic knowledge about anisotrop linear elasticity for composite materials
- Should know prediction and modelling methodology of a mechanical behaviour for a 1D mechanical ply
- Should have basic knowledge about analytical or numerical pre-dimensioning of simple composite
- Should have basic knowledge about the thermo-mechanical of a ply

Prerequisites: Mechanics of continuous fluids, linear algebra, implementation of composite materials.

Mé516 - Durability of Advanced Materials

At this end of this course, the student:

- Should know how to analyse microstructure and the physical phenmomena linked to advanced material durability
- Should know mechanics of advanced sustainibility of materials
- Should know notions about breakage mechanics

Prerequisites: MMC, Laws of behaviour, Composite materials

Mé517 - Nonlinear Numerical Simulation in Structural Mechanics

At this end of this course, the student:

- Should have basic knowledge on non-linear numerical simulation (non-linear mechanical behavior ...)
- Should know how to model a structure behavior and to be able to compare the model with experimental tests
- Should be able to make comparisons between numerical modellings and experimental results about general mechanical tests

Prerequisites: Aeronautics - General mechanics - Material resistance

Mé518 - Cursus project: Finite Element Method for Structures Calculation

The European Ariane 5 launcher is able of putting two satellites in orbit per flight. The satellites are located under the cap. Each satellite is fixed on a support: the payload adapter (ACU). Different phases of flight cause vibration in the satellites. The primary cause of those vibrations is the engine noise transmitted by the structure and through the air. The second cause is the shock wave caused by the separation of the different stages of the launcher.

The aim of this project is the design and numerical study of the ACU, the satellite and the ties between the two structures. We can define 3 mainly parts of this study:

1) Study of the dynamic behavior of the ACU
2) Design and vibration study of the satellite
3) Design of ties connecting the ACU to the satellite.

Prerequisites: Finite Elements Method, level 1 of the software Patran/Nastran, Continuum mechanics

VEHICLES Major - OPTION Energetics & Engines (EMO)

En511 - Cursus project: Turbomachinery enhancement and design projet for a turbojet engine

This module will focus on the design of inlet, exhaust nozzle, main combustor and aferburner modules. The overall design process is finalised by the presentation of engine tests, maintenance and manufacturing aspects and life cycle cost consideration.
Prerequisites : Thermodynamics applied to turbomachines (En33). Design of turbomachines - module 1 (En411) Aerodynamics of flows and profiles. Mechanics of beams - Mechanics of vibratory. Thermal exchanges. Mathematics associated with these modules.

En512 - Combustion

Objective:
Give students basic elements of combustion theory.
Have them write a combustion equation.
Calculate the various corresponding energy potentials.
Apply this knowledge to the case of the internal combustion engine.
Solve complex problems in groups (design office) related to energy potentials.
Prerequisites: Thermal engines for drones and light aviation.

En513 - Space Propulsion Systems

To introduce students to the architecture of propulsion systems for space launchers, Master the important parameters of these systems, To be able to dimension this type of propulsion system using simple methods and to estimate the performances.
To know the basics of the technology of these engines.
Prerequisites: Thermodynamics (In 21a and b) - Heat Transfers (En31), Applied Thermodynamics In 32b)

En514 - Analytical & numerical calculations in heat transfer

After a brief introduction which will remind basic elements on unsteady conductive heat transfer, original analytical methods for solving such equations will be exposed (separation of variables, Laplace transform, method of complex temperatures...). Exercices will also be proposed.
The second part of this course will focus on the numerical resolution of heat equation using finite dfference method. Students will achieve a Matlab program to solve an unsteady heat transfer problem. A preliminary version of the code will be provided to students.
Prerequisites: HeatTransfers (En31), Numerical resolution of partial differential equations by the finite differences (Ma32c)

Mf514 - Aeroacoustics

At the end of this course, students:
- will be familiar with the general concepts of acoustics and sound waves
- will be able to analyze the nature of a sound and determine its propagation
- will be able to determine a total sound level of a given environment
- will be able to discuss the acoustic qualité of a room and propose improvements in terms of sound insulation.
- will be able to use the basic concepts of aeroacoustics.
- will have an idea of how to reduce noise at source.

Prerequisites: Thermodynamics, Fluids Dynamics

Mf515 - Turbulence

At the end of this course, the student:
- Should be able to analyse the turbulence phenomenology
- Should know the notions of averaged equations
- Will be able to apprehend the fundamental equations of turbulence
- Should be able to write the different models of turbulence.

Prerequisites: Fluid Dynamics Course Aé412

MANAGEMENT Major - OPTION Management des projets industriels

Mi514a - Négociations Internationales

A l'issue de ce cours, l'étudiant sera en mesure :
- de diagnostiquer les difficultés rencontrées dans le cadre de négociation internationales.
- d'établir une stratégie dans le cadre de la négociation internationale.
- d'apprécier l'efficacité d'une stratégie de négociation internationale.

Mi514b - Contrôle de gestion

Ce module à pour objectif de permettre aux étudiants de maîtriser et d'appliquer les différentes méthodes d'analyse du seuil de rentabilité de l'activité des entreprises ainsi que les conséquences de différentes décisions de gestion.

Mi514c - Évaluation financière des projets

Ce module à pour objectif de permettre aux étudiants de maîtriser et d'appliquer les différents critères financiers d'analyse des projets industriels en situation complexe.

Mi514d - Analyse de la performance commerciale

A l'issue de ce cours, l'étudiant saura utiliser les méthodes, outils et indicateurs attachés à l'analyse de la performance commerciale, en tirer un diagnostic, décliner ce diagnostic en termes de management tactique et opérationnel de la force de vente. Il sera capable de resituer l'analyse de la performance commerciale dans le cadre plus général de du marketing management.

Mi514i - Challenge "négociations commerciales"

Cette simulation doit permettre aux étudiants d'appliquer les différentes techniques travaillées lors des cours de Négociations Commerciales Inyternationales (Mi-514-a), d'Analyse de la performence commerciale (Mi-514-d), d'Achats et relations fournisseurs (MI-513-a).

Mi514e - Analyse & gestion des risques des projets industriels

Ce module d'analyse et de gestion des risques des projets industriels à pour objectif de permettre aux étudiants de maîtriser la typologie des risques liés aux projets industriels et aux différentes techniques d'assurance possibles.

Mi514f - Financement des projets industriels

Ce module à pour objectif de permettre aux étudiants de maîtriser et d'appliquer les différentes techniques de financements des projets industriels.

Mi514g - Réponse à appel d'offres

A l’issu de ce cours, l’étudiant sera capable de :
- de gérer une réponse à appel d'offre technique par la maîtrise des procédures et outils disponibles.
- maîtriser l'ensemble des problématiques financières d'une réponse à appel d'offre.

Mi514h - Simulation informatisée à la gestion d'entreprise

Cette simulation a pour objectif de permettre aux étudiants d'appliquer l'ensemble de leurs apprentissages relatifs à lastratégie d'entreprise, la gestion d'entreprise et le management d'équipes. Celle-ci permet une synthèse de l'ensemble des cours travaillés en AERO5-MLI-MPI

MANAGEMENT Major - OPTION Management de la production et du MCO

Mi515a - Journée Etude de cas SLI

Ce module a pour objectif de permettre aux étudiants de maîtriser et d'appliquer les différentes méthodes d'analyse de la gestion des stocks, de la gestion de flux, de la gestion des risques, par des études de cas réels au sein de l'entreprise Matra-Electronics.

Mi515b - Approvisionnement et gestion des stocks

Ce module à pour objectif de permettre aux étudiants de maîtriser et d'appliquer les différentes techniques de gestion des stocks et des approvisionnements dans des configurations de complexité variée.

Mi515c - Techniques de gestion de la Qualité

Ce cours permet aux étudiants de connaitre les multiples outils et méthodes mettant en oeuvre les concepts et les principes d’une démarche Qualité appliquée au sein d’une entreprise (à vocation industrielle et/ou aéronautique). Au travers de plusieurs exemples concrets, ils découvriront toutes les facettes de ce domaine.

Mi515d - Supply chain (approfondissement)

A l’issue de ce cours, l’étudiant doit :
- Être capable de tenir un poste à responsabilité au sein de la supply chain d’une grande entreprise,
- Être capable, en tant que cadre au sein d’une enti-té de production, de prescrire ses besoins et ses contraintes aux différents responsables de supply chain qui l’approvisionnent et lui livrent ses produits.

Mi515e - Contrôle de gestion de la production

Ce module a tout d'abord pour objectif de permettre aux étudiants de maîtriser et d'appliquer les différentes techniques d'analyse des écarts sur coûts d'un produit. Ce module a ensuite pour objectif de permettre aux étudiants d'appliquer les techniques d'optimisation à la gestion de la production et à la logistique.

Mi515f - Cycle de vie des produits - Gestion de configuration

A l'issu de ce cours, les étudiants connaitront toutes les étapes de la conception des PRODUITS ET PROCESS depuis l'initiation du projet jusqu'à la production (étudier, concevoir et faire réaliser un ouvrage).

Mi515g - Après-vente - Maintenance : Navigabilité et MCO

A l'issu de ce cours, l'étudiant devra :
- connaitre l'historique et les exigences de la maintenance avion
- comprendre les raison de la maintenance aéronautique
- connaitre les processus de mise en place de la maintenance par l'intermédiaire des programmes de maintenance
- Etre capable de prendre en compte les contraintes liées à l'utilisation de l'avion
et le maintien en condition opérationnelle nécessitant le respect des règles de sécurité

IPSA
ÉCOLE D'INGÉNIEURS DE L'AIR ET DE L'ESPACE

Graduate School of Engineering specialized in Aircraft, Space and Smart Mobility

ecole.ipsa
ipsa
@IPSA
ipsa.aero
ipsaOfficiel

IONIS EDUCATION GROUP
Cti Commission des titres d'ingénieur
European Accreditation of Engineering Programmes EUR-ACE®
BIENVENUE EN FRANCE
[flə] QUALITÉ FRANÇAIS LANGUE ÉTRANGÈRE