

SHAKE THE FUTURE.



ENGINEERING PROGRAMME

COMMON-CORE CURRICULUM

YEAR 1
AUTUMN SEMESTER

MODELLING APPROACHES IN MECHANICAL ENGINEERING

YEAR 1 CORE CURRICULUM, ENGINEERING PROGRAMME
AUTUMN SEMESTER

Professor: Laurent STAINIER

Objectives

This is an introductory course to continuum mechanics, and more generally to modelling approaches in mechanics. It aims at providing the tools needed and used by engineers for mechanical design. It also establishes the foundation for more advanced courses in solid and fluid mechanics, for example dealing with non-linear cases.

At the end of the course, students should (at the minimum):

- be able to translate mechanics problems (fluids, deformable solids) into equations: select appropriate equations and specify associated boundary conditions;
- have a good understanding of notions such as strain (tensor), stress (tensor), constitutive model;
- have gained a first experience in numerical methods to obtain approximate solutions to mechanics problems expressed in equations.

Course contents

The course is structured into 14 modules (2h lectures + 2h tutorials), successively covering the following topics:

- Introduction
- Kinematics
- Stresses
- Conservation laws and energetic theorems
- Constitutive models (elasticity, Newtonian fluids)
- Numerical methods
- Recap and closing

In parallel to these modules, 4 laboratory sessions (4h) will allow students to explore these topics through experimental and numerical practice.

A significant amount of personal work is also expected.

Course material

- Introduction to Continuum Mechanics, W. Michael Lai, David Rubin and Erhard Krempf, Elsevier, 2010 (ebook accessible: <http://www.sciencedirect.com/science/book/9780750685603>)
- Mécanique des milieux continus, Jean Coirier, Carole Nadot-Martin, Dunod, 2013
- Continuum Mechanics, A.J.M. Spencer, Dover, 2004

Keywords

continuum mechanics; deformable solids; fluid mechanics; elasticity; structural mechanics; dynamics; numerical methods; finite elements

Links with other programmes

Engineering mathematics; Physics and Fluid dynamics; Materials

LANGUAGE	ECTS CREDITS	LECTURES	TUTORIALS	LABO	PROJECT
French	8	28 hrs	28 hrs	16 hrs	0 hrs

PRODUCT DESIGN AND DEVELOPMENT

YEAR 1 CORE CURRICULUM, ENGINEERING PROGRAMME

AUTUMN SEMESTER

Professor: Jean-François PETIOT

Objectives

To train the students in the different stages of the product design and development processes. The focus is placed on the different phases of the design process and on the different stakeholders (marketing, design team, prototyping, industrialization, quality control). The students will acquire the knowledge required to:

- understand and define customer needs (specifications)
- analyse the functioning of industrial products, as defined by technical documents and specifications
- model and simulate systems (CAD modeling, sizing)
- consolidate technical solutions and justify choices
- make different sub systems or parts, by using different industrial processes (machining, welding, cutting, boiler making) and ensure quality control

Course contents

Lectures in:

- The product development process
- Identification of user needs - Functional Analysis
- Machine Elements
- Industrial design and architecture
- Manufacturing processes

Tutorials in:

- Graphical elements
- CAD modeling and sketching
- Functional analysis
- Design for Manufacturing

The knowledge acquired is consolidated through the undertaking of a design project (APP) with CAD models (DFM, greendesign)

Tutorials on manufacturing processes

- Introduction to different manufacturing processes
- Computer Aided Manufacturing
- Machining, welding, innovative processes
- Industrialization

Course material

Product Design and Development. K. T. Ulrich and S. D. Eppinger. third edition, Mc Graw Hill, Irwin.

Product Design. Eger A., Bonnema M., Lutters E., Vand der Voort M. Eleven international publishing.

La conception Industrielle de Produits. Hermès Lavoisier, sous la direction de B. Yannou, H. Christophol, Jolly D., Troussier N.

Keywords

Engineering design, product development, industrial process, customer needs, digital mockup, industrial design

Links with other programmes

Engineering Mathematics – Physics and Fluid Dynamics – Materials

LANGUAGE	ECTS CREDITS	LECTURES	TUTORIALS	LABO	PROJECT
French	8	8 hrs	22 hrs	42 hrs	0 hrs

PHYSICS AND FLUID DYNAMICS

YEAR 1 CORE CURRICULUM, ENGINEERING PROGRAMME

AUTUMN SEMESTER

Professor: Isabelle CALMET

Objectives

Teach the fundamentals of fluid dynamics and describe the main fluid phenomena. Present the main classes of approximation used in fluid dynamics, and develop the classic methodologies to resolve fluid problems. Give an overview of applied hydrodynamics and aerodynamics in engineering.

Course contents

Lecture and Tutorial 1: Phenomenology et dimensional analysis

Lecture and Tutorial 2: Navier-Stokes equations

Lecture and Tutorial 3: Laminar and turbulent flows, boundary-layer concept/ Statics of fluids

Lecture and Tutorial 4: Perfect fluid approximation

Lecture and Tutorial 5: Generalized Bernoulli equation - Head loss.

Lecture and Tutorial 6: Momentum budget - Euler theorem

Lecture and Tutorial 7: Compressible flows and applied aerodynamics

Lecture and Tutorial 8: Fluid interfaces and applied hydrodynamics

Course material

In the School library there is a section on fluid dynamics where numerous reference books can be found, in French and in English (by Candel, Chassaing, Spurk, Morel & Laborde, Meier & Kempf, Joulié, etc.)

Keywords

Physics of fluids, Liquid and gas states, Molecular description, Concepts of pressure, density and temperature, Statics of Fluids, Fluid dynamics, Dimensional analysis, Reynolds number, Froude number, Mach number, Internal/external flows, Newtonian fluids, Navier-Stokes equations, Laminar flow, Turbulent flow, Turbulence, Boundary-layer, Incompressible fluid flow approximation, Archimedes principle, Euler equations, Potential flow, Lift, Drag, Kutta-Joukowski condition, Circulation, Flow past a profile, Bernoulli equation, Flow rate conservation, Energy balance, Generalized Bernoulli equation, Head loss, Hydraulic networks, Hydraulic machinery, Momentum balance, Euler theorem, Fluid forces, Compressibility effects, Acoustics, 1D isentropic flow approximation, Shock waves, Applied aerodynamics, Surface tension, Wetting, Applied hydraulics, Applied hydrodynamics

Links with other programmes

First year courses: Continuum mechanics / Applied thermodynamics

Second/third year specialisations: Ocean/ Hydrodynamics and Marine Engineering / Aeronautics / Engineering Science for Housing and Urban Environment / Propulsion and Transport

LANGUAGE	ECTS CREDITS	LECTURES	TUTORIALS	LABO	PROJECT
French	4	16 hrs	16 hrs	8 hrs	0 hrs

ENGINEERING ELECTIVE – BIOLOGY

YEAR 1 CORE CURRICULUM, ENGINEERING PROGRAMME

AUTUMN SEMESTER

Professor: Sophie LIMOU

Objectives

This introductory course is divided into 4 themes: Biology, Bioinformatics, Applied Biology, and Health Applications:

- 1) Biology covers the major physiological functions of life ('macro' level) and an introduction to genetics (molecular level).
- 2) The biotechnological revolutions that have taken place over the past 10 years in the biomedical field (eg genomics, transcriptomics, proteomics, metagenomics, digitization of medical records) have led to a paradigm shift marked by the advent of big data in healthcare. The use of digital tools is, therefore, essential today to be able to process, analyse, understand and integrate biomedical data. The bioinformatics class familiarises students with the Unix environment and the Bash/Shell code, as well as providing an introduction to R programming, a language widely used in statistics and data mining. This class is taught mainly in tutorial format.
- 3) Towards the end of the course students undertake an applied biology project in order to apply the knowledge acquired biology into the development of a bioinformatic tool in R (tool and interface). An individual report is expected from each student.
- 4) Finally, speakers from Nantes University Hospital will give several lectures to introduce the students to biomedical engineering applications. The objective of these conferences is to present the different fields of application of engineering skills in the biomedical field. Topics covered for the 2017-2018 year include precision medicine for the treatment of multiple sclerosis (Prof. PA Gourraud), biomedical imaging to maximize IVF (Dr. David L), and of blood vessel regeneration (Dr. C Levisage).

Course contents

While lectures are essential in biology to present new concepts (17 hours of lectures included), active learning is also proposed in the form of flipped classrooms, the use of online courses (MOOC), a conference system, and an applied biology project (6 hours of lab work).

Students are actively involved in the learning process and will deliver two presentations in small groups on a physiology topic and genetics issue.

As well as external speakers, the teaching team comprises Dr. Sophie Limou (in charge of the course) and Dr. Aurélien Sérandour. Mr. Jean-Baptiste Alberge (PhD student) will contribute to the R programming class.

Course material

Keywords

Links with other programmes

LANGUAGE	ECTS CREDITS	LECTURES	TUTORIALS	LABO	PROJECT
French	4	17 hrs	13 hrs	6 hrs	0 hrs

ENGINEERING ELECTIVE – INFORMATION SYSTEMS

YEAR 1 CORE CURRICULUM, ENGINEERING PROGRAMME
AUTUMN SEMESTER

Professor: Morgan MAGNIN

Objectives

The goal of this course is to address the modelling and design of complex systems. The added value of engineers with general vocational training is their ability to understand the complexity of systems at the interface between different disciplines. To do that, the engineer has to be able to build a global, abstract and shareable view of the system he designs.

In particular, information systems are central to any kind of social or scientific structure (companies, schools, hospitals, etc.) - they deal with the development, use and management of an organizations infrastructure. An information system is literally a structured set of services, methods and tools that can answer questions relative to a specific organization or domain.

Databases are one of the major underlying components of information systems: they store and process data as a permanent memory. Understanding the differences behind information systems, databases and Excel is thus crucial.

The course aims to develop skills in modeling and analysis of complex systems. It provides the essential knowledge in the field of information systems: design, deployment and their daily management. In such a context, databases require major attention. We present the main principles for modeling a system under the form of a database and give an introduction to relational algebra.

Finally, the course focuses on the legal issues surrounding information systems and databases: we give an overview of the European laws applying to such systems (with regard to data processing and rights resulting from the creation of databases, etc.)

Objectives of the course in terms of skills development:

- Knowing how to design a global, abstract and shareable view of a physical or logical system
- Mastering the manipulation of digital data:
- Acquiring data
- Structuring data
- Searching for information
- Presenting the results in summary form (reporting)
- Understanding the challenges of big data
- Applications to various industrial case-studies

Objectives of the course in terms of knowledge:

- Modelling language (physical or logical system)
- Query language
- Methodological approach
- Legal issues

Course contents

- 1) Modelling of complex systems
 - System-oriented approach
 - Modeling organizations
 - Modeling languages (UML, SysML)
 - Application to various industrial case-studies

- 2) Information Systems
 - Introduction to information systems: link between IS and organization
 - Design, modeling, deployment, operation
 - Organization, methods and tools for a company
 - Legal issues applicable to information systems and databases

- 3) Databases: relational algebra and modeling
 - Manipulation of data models
 - Introduction to SQL
 - Towards the decision IS and Business Intelligence
 - Presentation of the different "business" and challenges of information systems and databases in companies

Course material

Course syllabus available on the school online learning platform

Alain Faisandier. Systems engineering. Conference at AIP-PRIMECA Congress. April 2011.

Documentation from PostgreSQL. <http://docs.postgresqlfr.org/>

SysML Open Source Specification Project. <http://www.sysml.org/>

Keywords

system analysis, information systems, databases, European legal requirements and obligations, modelling, design, relational algebra, multitier architecture, client-server approach

Links with other programmes

The Algorithms and Programming course teaches students a number of central concepts about the rigorous design of algorithms. The Informations Systems course offers a complementary view of the challenges of IT within an organization with regard to system modeling and data manipulation.

LANGUAGE	ECTS CREDITS	LECTURES	TUTORIALS	LABO	PROJECT
French	4	16 hrs	10 hrs	10 hrs	0 hrs

ENGINEERING ELECTIVE - ELECTRONICS, ELECTRIC ACTUATORS, EMBEDDED SYSTEMS

YEAR 1 CORE CURRICULUM, ENGINEERING PROGRAMME
AUTUMN SEMESTER

Professor: Malek GHANES

Objectives

Embedded systems are increasingly present across all industrial sectors (automotive, avionics, electrical traction, robotics, renewable energy etc). This course aims to present how to make embedded computer control systems that are in most applications inseparable from converter-machine-electronic-microcontroller associations. The three aspects of these systems are presented: the most common types of electric motors and generators, electronics and power electronics, microcontrollers, both in terms of hardware and software.

Course contents

- Introduction: historical evolution from the first electric machines to microcontrollers.
- Single-phase sources, three-phase and static transformers.
- Components of power electronics.
- Converters: choppers, inverters, rectifiers.
- Motors and DC generators
- Engines and conventional induction motors
- Asynchronous motors
- Models and advanced machine controls.
- Equated electronic assemblies.
- Modeling diodes.
- Modeling bipolar transistors.
- Periodic Interrupts
- Introduction to embedded computing.
- Description of microcontrollers.
- Inputs / outputs.
- Analog inputs.
- PWM output.

Course material

D. Grenier, F. Labrique, H. Buyse. Electromécanique - convertisseurs d'énergie et actionneurs, Dunod, Collection: Sciences Sup, 2009.

J. Chiasson, Modelling and High-Performance Control of Electric Machines, IEEE series on Power engineering, Wiley-Interscience, ISBN 0-471-68449-X, 2005.

C. Le Trionnaire, J.-P. Picheny, Génie électrique vademecum d'électrotechnique, Ellipses - Technosup, ISBN13: 978-2-7298-6101-8 2010.

P. Mayé, Moteurs Electriques pour la robotique, Dunod, Techniques et Ingénierie, EAN13: 9782100700363, 2013.

Albert Paul Malvino, David J. Bates, Principes d'électronique, Dunod, 2008, EAN13: 9782100516131

P. Molinaro, A. Chriette, électronique analogique: traitement des composants et circuits, Ellipses Technosup, 2013, ISBN-13: 978-2729882273.

C. Valens, Maîtrisez les microcontrôleurs à l'aide d'Arduino, Publitronic-Elektor, 2013, ISBN-13: 978-2866611903.

F. Schaeffer, Programmation en C des microcontrôleurs RISC AVR, Editeur : ELEKTOR PUBLITRONIC, 2009, ISBN-13: 978-2866611699.

Keywords

Electrical energy converter, power electronics, electric motor, electric generator, control, dipole, quadropole, diode, bipolar transistor, MOSFET, microcontroller, embedded computing, input / output programming.

Links with other programmes

From Measurement to Control

LANGUAGE	ECTS CREDITS	LECTURES	TUTORIALS	LABO	PROJECT
French	4	18 hrs	10 hrs	12 hrs	0 hrs

ENGINEERING ELECTIVE - MATERIALS

YEAR 1 CORE CURRICULUM, ENGINEERING PROGRAMME

AUTUMN SEMESTER

Professor: Christian BURTIN

Objectives

This course offers an introduction to the science of materials. It provides the necessary grounding to make an informed choice of material according to the operational environment.

Course contents

Upon completion of this course the students should be able to:

- describe the highly ordered structure of crystal and its consequences for mechanical properties
- select a metal using a phase diagram
- understand the role of defects on the mechanical properties of materials
- know which solidification mechanisms increase the mechanical properties of materials
- take account of the specific characteristics of polymers - viscoelasticity, and of composite materials - anisotropy.

Course material

Des Matériaux, Jean Paul BAILON, Presses Internationales Polytechnique

Keywords

Links with other programmes

Modelling approaches in mechanical engineering

LANGUAGE	ECTS CREDITS	LECTURES	TUTORIALS	LABO	PROJECT
French	4	12 hrs	12 hrs	16 hrs	0 hrs

ENGINEERING ELECTIVE - APPLIED THERMODYNAMICS

YEAR 1 CORE CURRICULUM, ENGINEERING PROGRAMME
AUTUMN SEMESTER

Professor: Jean-Francois HETET

Objectives

- To understand the fundamental laws of thermodynamics.
- To apply these laws to study industrial processes involving energy transformation or transfer phenomena.
- To take account of the environmental impact of energy production and consumption.

Course contents

- History of the main ideas in thermodynamics.
- Laws of thermodynamics and selected elementary results: closed/open systems, perfect and real fluids - a phenomenological study.
- Energy transformations-compressors, nozzles, turbines
- Phase transitions: properties of mixtures, thermodynamic tables and diagrams.
- Thermodynamic cycles and thermal machines. Direct cycles: Carnot, Rankine, Hirn, reheating cycles, Joules cycle, Beau de Rochas and Diesel cycles. Introduction to turbocharging. Inverse compression cycles: Carnot and Joules cycles, heat pump, refrigeration and air conditioning. Humid air. Steam absorption cycles.
- Thermodynamics of unbalanced systems - general principles.

Course material

Thermodynamique et Energétique par M. BOREL (Presses Polytechniques Romandes)

Thermodynamique générale et application par R. KLING (Technip)

Thermodynamique par J.P. PEREZ (Masson)

Energétique par M. FEIDT (Dunod)

Introduction aux problèmes énergétiques globaux par R. GICQUEL (Presses des Mines)

Keywords

Entropy, Enthalpy, Reversibility, Irreversibility, two phase flow, nozzle, Compressor, gas turbine, steam turbine, Cogeneration, heat pump, Conduction, Convection, radiation

Links with other programmes

Pre-requisite for more advanced specialisations.

LANGUAGE	ECTS CREDITS	LECTURES	TUTORIALS	LABO	PROJECT
French	4	16 hrs	24 hrs	0 hrs	0 hrs

MODERN LANGUAGES 1 - ENGLISH

YEAR 1 CORE CURRICULUM, ENGINEERING PROGRAMME
AUTUMN SEMESTER

Professor: Christine Evain & Spencer Hawkrige

Objectives

Acquisition and reinforcement of basic vocabulary, syntax, and pronunciation by both traditional means multimedia resources. The teaching approach is communicative meaning that the language is not only the subject matter of the course, it is also a means of communication that the students should appropriate in an optimal manner.

Course contents

The course activities cover a whole range of practical language and communication exercises that span written and oral comprehension and expression.

Written: multiple choice, gap filling, rephrasing;

Oral: awareness of registers, intonation, syntax as it applies to different situations, debates, linguistic consequences of cultural differences, using media, telephoning.

Course material

Preparation manuals for the various foreign language certificates. Written and televised press, internet, general civilization documents, numerical tools.

Keywords

Managerial and cultural skills; communicative teaching approach; procedural methods; multimedia

Links with other programmes

Communication in French / Management / Corporate cultures

LANGUAGE	ECTS CREDITS	LECTURES	TUTORIALS	LABO	PROJECT
English	1	0 hrs	26 hrs	0 hrs	0 hrs

MODERN LANGUAGES 2

YEAR 1 CORE CURRICULUM, ENGINEERING PROGRAMME
AUTUMN SEMESTER

Professor: Frédéric Dorel

Objectives

Students will study one of the following languages in addition to English:

- French (for international students) – see below
- German
- Spanish – see below
- Italian
- Japanese
- Chinese
- Russian
- Arabic
- Portuguese

As well as for preparing the certificates required in English/French, the students will learn basic communication skills (enough to communicate on a daily basis at a non-specialist level) including the comprehension of the particular country's social, political and cultural context through written and televised press in their choice of modern language. The acquisition and reinforcement of basic vocabulary, syntax, and pronunciation by both traditional means and using multimedia resources. The teaching approach is communicative meaning that the language is not only the subject matter of the course, it is also a means of communication.

NB: International students whose native language is not French (and do not speak French fluently) must take French as a foreign language course and pass the TFI *Diplôme de Langue Française*. If their native language is not English, these students must also take the English course, a compulsory language at ECN.

Course contents

The course activities cover a whole range of practical language and communication exercises that span written and oral comprehension and expression. Preparation for language competence certificates: B2 in German, DELE in Spanish, TFI in French as a foreign language. Certificates in Italian, Japanese, Portuguese and Chinese are also available.

Written: multiple choice, gap filling, rephrasing;

Oral: awareness of registers, intonation, syntax as it applies to different situations, debates, study of unique situations, linguistic consequences of cultural differences, using media, telephoning.

Course material

Preparation manuals for the various foreign language certificates. Written and televised press, internet, general civilization documents, Numerical tools.

Keywords

Managerial and cultural skills; communicative teaching approach; procedural methods; numerical.

Links with other programmes

Communication in French / Management / Corporate cultures

LANGUAGE	ECTS CREDITS	LECTURES	TUTORIALS	LABO	PROJECT
According to choice	1	0 hrs	26 hrs	0 hrs	0 hrs

French

The classes are organised into workshops to alternate work on the four language skills in level groups:

- Theatre / song / oral expression / phonetics
- Film / cinema
- Media / oral comprehension (TV-radio)
- Written expression / news writing
- Grammar games
- Interculturalism / advertising / language register / idiomatic expressions
- CVs/ cover letters / job interviews / telephone skills
- TFI diploma

Common theme linking the workshops: production of interactive online news.

1) Theatre (all levels).

Work based on plays (Molière, Cyrano) with emphasis on phonetics.

Beginner level: simple dialogue, production and roleplays.

Production: Arts column - video, reviews.

2) Cinema (advanced level):

Multimodal interpretation of a selection of French films (L'Auberge Espagnole, Entre les murs, Ressources Humaines, etc.).

Description of images, analysis, interaction (gestures etc)

Production: Arts column – cinema reviews, surveys, visit or exchange with ESMA film school.

3) Media (all levels):

Listening exercises adapted to different levels

Advanced level: work on caricatures (les Guignols).

Production: quiz or crosswords, Web-TV

4) Written expression (all levels):

Work on the different columns of a newspaper and the specific vocabulary, according to the group level.

Production: articles, ads

5) Grammar games (all levels):

Grammar work essentially using teaching aids, according to the group level.

Production: interactive platform game.

6) Interculturalism (advanced level):

Explore and debate cultural differences.

Work on language register and idiomatic expressions through advertising.

Production: advertising inserts, debates, Web-TV.

7) Job applications – job interview (advanced level):

Write a CV and cover letter – work on specific vocabulary.

Prepare a job interview.

Production: Job offers / 'ready to go' applications

8) TFI (advanced level):

Familiarise with the B2 certification format.

Alongside workshops work on field experiences:

Linguistic challenges <https://monnantesamoi.wordpress.com>

photo rally and information on monuments

weekend activity log

cinema and theatre outings + reviews and/or interviews

photo exhibitions with textual descriptions

surveys (student / leisure / holiday budgets)

sketches on the theme 'French characters'

technical vocabulary project: invention (Concours LEPINE)

Spanish

- Acquisition and reinforcement of the 4 competencies in written and oral expression & comprehension.
- Acquisition of vocabulary, syntax and pronunciation by both traditional means and through the use of digital resources.
- Discovery of the Spanish-speaking worlds.

Methods:

- Individual and group productions & presentations
- Written, digital and audiovisual tools
- 2 communicational approaches:

1) Monographical lectures on various engineering specialisations with active contributions from the students (debating, group and individual productions and presentations).

2) Multi-week projects on corporate cultures, engineering and techniques in Spanish-speaking cultures. Virtual - but realistic- projects producing the theoretical implementation of a professional activity.

Public presentations of the results.

SPORTS AND PHYSICAL EDUCATION

YEAR 1 CORE CURRICULUM, ENGINEERING PROGRAMME

AUTUMN SEMESTER

Professor: Hervé Guillo

Objectives

Sports and physical education contribute significantly to an engineer's physical, psychological, social and intellectual development, as well as to his/her general well-being. These activities:

- strengthen self-esteem,
- trigger a sense of competition and solidarity, team spirit and the desire to succeed,
- prepare for the demands of a career by fostering team and individual initiative,
- encourage a sense of responsibility related to positive characterisation and identity.

Course contents

Sports and physical education develop social communication through:

- various team activities (on small and large fields),
- autonomy projects (TA),
- physiological-directed activities (development of cardiopulmonary and muscular functions),
- organisation of sports events

Course material

Keywords

Links with other programmes

LANGUAGE	ECTS CREDITS	LECTURES	TUTORIALS	LABO	PROJECT
French	1	0 hrs	40 hrs	0 hrs	0 hrs

MANAGEMENT AND THE BUSINESS ENVIRONMENT

YEAR 1 CORE CURRICULUM, ENGINEERING PROGRAMME
AUTUMN SEMESTER

Professor: Laurence BERTHO

Objectives

Nowadays the skills of an engineer are not only scientific, technical, and managerial. An engineer also needs awareness of economic, legal, and financial concerns. The aim of this course is to enable our future engineers to become more aware of their working environment.

This first semester aims to provide a grounding in communication, in project management and to enable the students to start thinking about their career plans and personal development. An introduction to marketing is also provided.

Communication: Since the humanities and interpersonal skills play an increasingly important role in the life of an engineer, this course has been designed to develop the students general abilities in communication in order to realize their potential and their individual assets. Course objectives include personal development, de-mystifying public speaking, mastering the practical aspects of communication (gestures, use of space and time, expressing and managing emotions).

Course contents

1) Career planning and personal development: the necessity of building your own career plan. Support in your applications for internships, definition of your skills, writing CVs and cover letters.

2) Project management:

- Leading a project
- Managing the project
- Knowing the various operators, project manager, contractor, client (the contracting authority)
- The social, political and economic environment of the project
- The general management: the key skills
- The process: starting, planning, operating, supervising and controlling, completion

3) Communication:

This first year course focuses mainly on public speaking, active listening and emphasising the message as well as its persuasive force, in order to make the students more aware of effective communication. Students will learn new communication techniques through simulations and role-playing, improvisation, debates, presentations, using video as an evaluation tool. Also covered are methods to control the pragmatic aspects of interaction (body movements, use of space, expression and management of your feelings) and professional written communication with practical exercises.

Course material

Maders, Clet: Comment manager un projet: les 7 facettes du management de projet

Moine JY: Manuel de gestion de projet: méthodologie de structuration et de gestion d'un projet industriel

Le management des risques des entreprises et de gestion de projet - Hermès sciences Publiques

Allegret JP: Monnaie, finance et mondialisation

Buigues P, Lacoste D: Stratégies d'internationalisation des entreprises: menaces et opportunités

François B, Fricoté E: Economie: ce qu'il faut savoir

KAEPPÉLIN Ph. L'écoute. Mieux écouter pour mieux communiquer Ed. ESF

BELLENGER L. Approche de la parole expressive Ed. ESF

BOURRON Y. Pédagogie de l'autoscopie Ed. d'Organisation

Keywords

Career plan, personal development, self-awareness, communication, project management, organisation, planning, social, managerial and cultural skills, non-verbal communication, self-image, strength of conviction, commitment and ethics.

Links with other programmes

All teaching departments and specialisations.

LANGUAGE	ECTS CREDITS	LECTURES	TUTORIALS	LABO	PROJECT
French	0.5	10 hrs	36 hrs	0 hrs	0 hrs

SOCIAL SCIENCE ELECTIVE - IRELAND

YEAR 1 CORE CURRICULUM, ENGINEERING PROGRAMME

AUTUMN SEMESTER

Professor: Melanie MacFARLAND

Objectives

- Ireland, a historical view.
- Has the war ended?
- Has the new generation chosen materialism and peace over conflict?
- How is Brexit going to change Ireland's perspective on the EU?
- Are the Republic of Ireland and Northern Ireland going to merge back together?

Course contents

1. Background - historical view including the separation of Ireland and Northern Ireland in 1921.
2. The troubles in the 1970s - study of politics, economics, religions, sociology
3. Continued
4. The impact of the hunger strikes in the early 80s
5. The strengths of women during the war, sectarian bullying in the workplace and how Ireland's economy and new work force have impacted Europe
6. The contribution of Ireland to the contemporary world and what could be a proposal for the future in the 21st Century. What does the country face today?

Course material

Keywords

Links with other programmes

LANGUAGE	ECTS CREDITS	LECTURES	TUTORIALS	LABO	PROJECT
English	0.5	12 hrs	0 hrs	0 hrs	0 hrs

SOCIAL SCIENCE ELECTIVE - RELIGION & SOCIAL CHANGE IN CONTEMPORARY EUROPE AND NORTH AMERICA

YEAR 1 CORE CURRICULUM, ENGINEERING PROGRAMME
AUTUMN SEMESTER

Professor: Frédéric DOREL

Objectives

Religions are a major contemporary issue. Beyond offering new trends for personal growth in the 21st century, religions are intertwined with most contemporary concerns in the world: politics, sustainability, secularisms, various definitions of modernity and identity, science, technologies, reason.

This course is designed as an introduction to a general reflection on the relationships between religions and those temporal issues, with particular emphasis on 21st century Europe and North America.

When you have successfully completed this course, you will:

1. Understand the basic elements of the definitions scholars have given of religions
2. Be able to make use of the methods employed in the study of the sociology of religions to reflect on a community
3. Be able to explain some of the primary characteristics of the largest religions—including civil religions—as well as of the various secularisms
4. Gain insight into and be able to explain your understanding of the impact of religions on social life in the contemporary world
5. Gain insight into your own understanding of tolerance

Course contents

Course is taught in English.

This is not a course on the history of religions. It is a course on the impact of contemporary beliefs on our world, on social and individual life, politics, science, etc., on the way religions contribute to the construction of our ideas and societies, social links, ethics, violence, solidarity, exclusion, etc. We won't be discussing the issue of 'Why religions?'. We'll be more deeply interested in the issue of 'How religions?' i.e. the situation of religions in the 21st century world. What is the social role of religions today?

This course is not intended to be comprehensive, but a core of ideas around which you will complete your own emphasis. This course will be a tool-box, a general reflection on the relationships between religions and temporal issues, politics, science and technologies and finally with what is called reason, which can also be an additional religion or an additional magic mind.

PLAN:

Part 1 - Religions and private affairs.

Part 2 - Religions and public affairs: the political role of religions in Europe and the current tensions between Christianity, Secularisms and Islam.

- a. European Christianity and the issue of the Christian inheritance of Europe
- b. European secularisms
- c. Various theories in relation to secularisms
- d. European Islam: fears and facts
- e. Beyond radicalisms: a way towards a European Union religious balance?

Part 3 - Religions and public affairs: the political role of religions in North America and the current tensions between Christianity, Secularisms and several other religions.

- a. Main differences with the European perception of religions.
- b. US Christianity and the issue of the Christian inheritance of the US
- c. US secularisms and /or US Civil religion
- d. Canadian Christianity and the issue of the Christian inheritance of Canada

Part 4 - Canadian secularisms and /or Canada Civil religion

Conclusion

Course material

Full list will be provided.

Keywords

Religions are intertwined with most contemporary concerns: politics, sustainability, secularisms, various definitions of modernity and identity, science, technologies, reason.

How can we confront the various religious organisations with the various contemporary expectations? Our common ability to understand and manage fairly the religious diversity of our world will define tomorrows world, in order to try to live together and not only side by side.

Links with other programmes

English.

All the other elective courses taught by the CLES Department.

LANGUAGE	ECTS CREDITS	LECTURES	TUTORIALS	LABO	PROJECT
English	0.5	12 hrs	0 hrs	0 hrs	0 hrs

SOCIAL SCIENCE ELECTIVE - SOCIOLOGY AND BUSINESS MANAGEMENT

YEAR 1 CORE CURRICULUM, ENGINEERING PROGRAMME
AUTUMN SEMESTER

Professor: Laurence BERTHO

Objectives

Basics in sociology and in the sociology of organizations.

- Historical reminder: definitions, trends, methods and techniques. The development of organizations in its historical context; the authors with an impact on organizations: Taylor, Fayol, Weber.
- The Industrial Revolution.
- The evolution of organizations and of production from Taylors time up to now.
- The evolution of organization theory (from the scientific labour organization to contingency theory).
- Current research trends.

A scientific approach to the humanities field interacting with numerous disciplines. The sociology of organizations and the emergence of corporate sociology. The company as an organization: deciphering, functioning, organization chart, staff representation, trade unions, rules and the labor code.

Course contents

Analysis of the needs and motivations at work; identities at work and corporate culture; skills, values and types of investment at work; strategic analysis; intergenerational management; well-being at work: the psychosocial risks. Training on current social issues, union representation, Sunday working, generation Y, changes in relation to the 35 hr-working week.

Accounts by entrepreneurs and engineers on their careers and on current managerial practices.

Personal test: What is your investment at work? - following Holland's typology.

Course material

Keywords

Organization, human resources, management, strategy, power, corporate culture, identity at work. Surveys, questionnaires, interviews, statistics. Curriculum, management, leadership, well-being at work, psychosocial risks, trade unions, staff representation, recruitment, job and skills management.

Links with other programmes

LANGUAGE	ECTS CREDITS	LECTURES	TUTORIALS	LABO	PROJECT
----------	--------------	----------	-----------	------	---------

French	0.5	12 hrs	0 hrs	0 hrs	0 hrs
--------	-----	--------	-------	-------	-------

SOCIAL SCIENCE ELECTIVE – CITIES, CLIMATE, CORPORATIONS: THE DANGEROUS LIAISONS

YEAR 1 CORE CURRICULUM, ENGINEERING PROGRAMME
AUTUMN SEMESTER

Professor: Géraldine Molina

Objectives

Cities, climate, corporations: the dangerous liaisons.

Paris recently welcomed the 21st World Conference on the climate. When climate change is listed among the priorities of the political agendas, a better understanding of the relationship between the cities and the climate represents a major scientific, social and environmental issue.

Indeed cities pose with a particular intensity the question of climate change, of how vulnerable and adaptable companies are faced with such changes.

Indeed, half of the world's population now lives in cities and are exposed to particular climates. How does atmospheric change concretely act on us city dwellers, on our everyday lives and our urban habits? How do our movements make us experience complex phenomena such as the urban heat island or the urban microclimates? How can we face the city climates with the help of an interdisciplinary approach welcoming the physical, technical and social dimensions of the change?

The climate change which affects our cities and their vulnerability needs to be observed over a longer period of time. How did cities adapt or try to free themselves from climatic constraints? Which pernicious effects did the past developments have on the climate? Which teachings can help us think about and plan the cities of tomorrow?

Course contents

In order to answer these questions, this course proposes various entries and at the same time entertaining, pragmatic and thoughtful educational approaches mobilizing story-telling in particular.

I shall indeed introduce feedback on field studies, narratives of professionals and city dwellers confronted with the urban climate in their professional or daily practices.

This elective course aims at enhancing your general knowledge on a growing environmental issue for modern companies.

The course will enable you to acquire interdisciplinary skills (knowledge, know-how and social skills) to face the complexity of the urban climate, which is a major subject also offering job opportunities.

Course material

Keywords

Links with other programmes

LANGUAGE	ECTS CREDITS	LECTURES	TUTORIALS	LABO	PROJECT
French	0.5	12 hrs	0 hrs	0 hrs	0 hrs

SOCIAL SCIENCE ELECTIVE - DESIGN & ICONOGRAPHY

YEAR 1 CORE CURRICULUM, ENGINEERING PROGRAMME
AUTUMN SEMESTER

Professor: Florent LAROCHE / Josep PINYOL VIDAL

Objectives

The English word "design", which was adopted in the ornamental and industrial fields in the esthetic dimension of objects, echoes etymologically with the French word "drawing".

However, much beyond the intellectual conception of the object or the product, the French word also evokes the concrete idea of the image applied to a support.

The object is a sign combining the function and the shape. We can identify the period of time of manufacturing of an automobile by its shape. However, its function remains essentially identical.

Objectives:

- become acquainted with the main stylistic and esthetic features.
- Read an image by applying a method - iconography and iconology.

Course contents

1. Concepts: space, volume, light, texture, composition, perspective
2. Trends in taste and style
3. Iconography and iconology
4. Interaction of dominant aesthetics: political, religious, industrial etc
5. The eclecticism of industrial society
6. Image and propaganda.
7. Technique and aesthetics (science fiction images)
8. History of engineering schools
9. Industrial Revolutions

Course material

Keywords

Links with other programmes

LANGUAGE	ECTS CREDITS	LECTURES	TUTORIALS	LABO	PROJECT
French	0.5	12 hrs	0 hrs	0 hrs	0 hrs

SOCIAL SCIENCE ELECTIVE - SHAKESPEARE'S PRINCIPLE PLAYS

YEAR 1 CORE CURRICULUM, ENGINEERING PROGRAMME
AUTUMN SEMESTER

Professor: Christine EVAIN / Spencer HAWKRIDGE

Objectives

What is the purpose of literature? Is it of any use to someone in prison? This course will take its cue from Laura Bates research and mainly from her book entitled, *Shakespeare Saved My Life: Ten Years in Solitary with the Bard*. Professor Bates tells the story of federal prison inmate Larry Newton, who was (and most probably still is) locked up in solitary confinement. Larry Newton participated in Bates' 'Shakespeare in Shackles' literature class, and, according to his own testimony, this class gave him a new lease of life.

It is quite obvious that our elective course cannot match Laura Bates dedication to prisoners. However, we will try to share our interest in literature with volunteer inmates by holding two of our classes in Nantes prison. We will also try to reflect on the value of art and literature in relation to the promotion of art and reading in prison. In order to do so, we will work on some of the challenging questions from Shakespeare's works (focusing on such topics as pride, honour, conscience, love, hate and revenge) - questions which, we hope, encourage not only prisoners, but also ourselves, to consider the world in a new light.

Course contents

In-depth study of 6 plays by Shakespeare:

- 2 comedies
- 2 tragedies
- 2 historical plays

Course material

The complete text for all plays can be found on the following website: <http://nfs.sparknotes.com/>
Additional resources are to be found on MOODLE.

Keywords

comedies, tragedies, historical plays, promotion of art, reading in prison, pride, honour, conscience, love, hate and revenge.

Links with other programmes

- General English (a very good language level is required for this course).

LANGUAGE	ECTS CREDITS	LECTURES	TUTORIALS	LABO	PROJECT
English	0.5	12 hrs	0 hrs	0 hrs	0 hrs

SOCIAL SCIENCE ELECTIVE - HISTORY OF SCIENCE AND TECHNIQUES

YEAR 1 CORE CURRICULUM, ENGINEERING PROGRAMME
AUTUMN SEMESTER

Professor: Florent LAROCHE

Objectives

When techniques operate outside their field of action: a visit through history.

Nowadays, engineers no longer possess just technical potential: they have to become part of the whole technical system to which they are committed. Consequently, this multidisciplinary dimension provides them with all the necessary tools to carry out their duties: mechanics, natural science, chemistry, computing, communication, management, law, etc. But the technical system has anteriorities and consequences which should be addressed. The acts of the engineers will eventually have repercussions on their own existence, their jobs or on their companies.

Through examination of the evolution in the training of technical people from the Renaissance through to the creation of the first engineering schools, we will try to identify the duties entrusted to this new job. Was Leonardo da Vinci an engineer or an inventor? Why such a classification? Where are the boundaries between invention, creation and design?

More recently, our society has undergone important changes in its way of thinking and identifying the achievements of its goals. Whether we look at the development of mass industry at the beginning of the 20th century, or the electrification of France, and in particular its electro-nuclearisation, or the first tentative steps towards the nuclear bomb with the Manhattan project; a historical perspective now enables us to identify the consequences in terms of evolution of Science and techniques, as well as of the foundation of the socioeconomic context and of ethics.

Course contents

This elective course will introduce several scientific and technical examples and historical points of reference for future engineers. As a supplement to classes, a reference to general documents will be provided covering the major historical and philosophical landmarks, as well as a sectorised bibliography.

The course will include conferences, debates, tutorials and visits to heritage sites.

In order to finalize this elective course, personal work will be conducted according to the students choices. Mini-projects will be completed by teams of students with in groups of between two and seven students. For example, these projects can entail reading specialized works; they can also involve archival or monographic research; heritage or museum activities. The involvement of external partners is also welcome.

Course material

Keywords

Links with other programmes

LANGUAGE	ECTS CREDITS	LECTURES	TUTORIALS	LABO	PROJECT
French	0.5	12 hrs	0 hrs	0 hrs	0 hrs