Subject name: Machine and Deep Learning	Code EC: DMA09-AAAP
Number of hours per student: 40 h	ECTS Number: 3.5
Reference Teacher: KACETE Amine	

Generalities

Objectives *(2000 characters)*

- Theoretical aims and objectives: Understand and master machine learning and deep learning techniques.
- Empirical aims and objectives: Design complete training and inference pipelines:
  Database preparation, cleaning, and preprocessing.
  Modeling of predictive models.
  Design of optimization loops.

Description *(2000 characters)*

- Part I: Introduction to Artificial Intelligence:

- Part II: Machine Learning:

* Fundamentals, Definition, and Generalities.
* Support Vector Machines.
* Decision Trees and Random Forests.
* Neural Networks.
* Practical Exercises.

- Part III: Deep Learning:

* Paradigms
* Convolutional Neural Networks.
* Autoencoders.
* Practical Exercises.

- Part IV: Generative Deep Learning:

* Paradigms and Techniques.
* Generative Adversarial Networks
* Application to Image Generation.
* Practical Exercises.

Requirements *(2000 characters)*

This course requires a solid understanding of:
- Probability and statistics.
- Linear algebra and matrix calculus.
- Linear and nonlinear optimization.
- Numerical computation and object-oriented programming.

Course requirements and assessments

Teaching Language *(2000 characters)*

French (English if necessary (when some student(s) can not use French)

Teaching methods *(500 characters)*

Lectures, exercises and labs.

Number of hours per course type: *(2000 characters)*

CM: 22
TD: 8
TP: 10
PR:
CONF:
Autres:

Evaluation *(200 characters)*

Project including:

- Mini bibliography
- Data collection and implementation of training and inference.
- Qualitative and quantitative experiments.
- Technical summary report.

Bibliography

Bibliography *(2000 characters)*

- CM Bishop. Pattern recognition and machine learning.
- T Hastie et al. The elements of statistical learning: data mining, inference, and prediction
- I Goodfellow. Deep learning
- A. Criminisi et al. Decision Forests for classification, Regression, Density Estimation, Manifold Learning and Semi-Supervised Learning

Contacts

Contacts *(2000 characters)*

amine.kacete@insa-rennes.fr

Other information

Other information

Subject name: Uncertainty and Sensitivity Analysis in Engineering	Code EC: DMA09-AIS
Number of hours per student: 40 h	ECTS Number: 3.5
Reference Teacher: SUEUR Roman, CHABRIDON Vincent	

Generalities

Objectives *(2000 characters)*

At the end of this module, students will be able to master the techniques for dealing with uncertainties in numerical simulation, and to implement methods for exploring numerical models and performing global sensitivity analysis.

Description *(2000 characters)*

(7 sessions):

Session #1 – Introduction: reliability and uncertainty propagation (R. Sueur)

Structural reliability
Reliability analysis for repairable systems and lifetime data analysis
Uncertainty quantification and propagation for reliability assessment
➲ Lab: implementation with the OpenTURNS software

Sessions #2 et #3 – Metamodels for uncertainty management (R. Sueur)

Introduction to the various families of metamodels / surrogate models
Introduction and presentation of the simple Kriging
Numerical designs of computer experiments for building metamodels (space-filling designs)
Links with Gaussian processes and Bayesian interpretation
Validation of a Kriging metamodel
➲ Lab: implementation with the OpenTURNS software

Sessions #4 et #5 – Global sensitivity analysis (V. Chabridon)

Overview and challenges
Sensitivity indices based on variance decomposition (Sobol' indices)
Screening methods dedicated to high-dimensional problems (the Morris method, HSIC indices)
➲ Lab: implementation with the OpenTURNS software

Session #6 – Continuation/finalization of projects and openings (R. Sueur)

Finalization of numerical projects (labs)
Discussion and opening about complementary topics: calibration under uncertainty, robust optimization, links with statistical learning / machine learning
➲ Bibliographical analysis project: in-depth study of a scientific article related to course themes

Session #7 – Final assessment (R. Sueur, V. Chabridon)

Individual presentation of the bibliographical analysis project (presentation: 20 min + 10 min Q&A)

Requirements *(2000 characters)*

This course requires mastery of the module program "Intrdouction to mathematical software" and "Python and scientific Modules" (DMA-3A-1S), "Linear Regression Model" (DMA-3A-2S) et "Design of Experiments" (DMA-4A-2S).

Course requirements and assessments

Teaching Language *(2000 characters)*

Français

Teaching methods *(500 characters)*

- Course materials: slides
- Labs: Jupyter Notebooks based on Python and OpenTURNS (https://openturns.github.io/www/)

Number of hours per course type: *(2000 characters)*

CM: 22 h
TD:
TP:
PR: 18 h
CONF:
Autres:

Evaluation *(200 characters)*

- Oral presentation (quality of presentation and media, responses to questions)
- Lab report

Bibliography

Bibliography *(2000 characters)*

- Da Veiga, S., Gamboa, F., Iooss, B., Prieur, C. Basics and Trends in Sensitivity Analysis: Theory and Practice in R. SIAM, 2021.
- Rasmussen, C. E., Williams, C. K. I. Gaussian Processes for Machine Learning. MIT Press, 2006.

Contacts

Contacts *(2000 characters)*

roman.sueur@insa-rennes.fr, vincent.chabridon@insa-rennes.fr

Other information

Other information

- Third-year students in the Engineering curriculum / Master 2 in Applied Mathematics, students wishing to pursue their career in an industrial R&D Lab or to apply for a doctoral thesis

Subject name: Optimal Control	Code EC: DMA09-CO
Number of hours per student: 40 h	ECTS Number: 3.5
Reference Teacher: BELMILOUDI Abdelaziz, HADDOU Mounir, LEY Olivier	

Generalities

Objectives *(2000 characters)*

Our overall goal is to provide an understanding of the main results in optimal control and how they can be used in various applications. We will introduce and investigate key basic optimal control concepts and extend to some advanced algorithms and techniques. We will focus on both modelization and solution techniques.

Description *(2000 characters)*

Modelling principles of a control problem.
Controllability , observability and Stabilization .
Optimality principles .
HJB equations , LQR control .
Direct and indirect methods .
Practical examples and exercises using MATLAB &/or Python

Requirements *(2000 characters)*

Course assumes a good working knowledge of linear algebra and differential equations. New material will be covered in depth in the class, but a strong background will be necessary. Course material and homework also assume a good working knowledge of MATLAB and Python.

Course requirements and assessments

Teaching Language *(2000 characters)*

French (English if necessary (when some student(s) can not use French)

Teaching methods *(500 characters)*

Lectures, exercises and labs. (Some labs are done in reverse mode)

Number of hours per course type: *(2000 characters)*

CM: 14
TD: 14
TP: 12
PR:
CONF:
Autres:

Evaluation *(200 characters)*

One written examination (2/3 of the final mark) and a practical examination and/or project (1/3 of the final mark).

Bibliography

Bibliography *(2000 characters)*

M. Bergounioux. Optimisation et contrôle des systèmes linéaires. Dunod, 2001.
A. Locatelli. Optimal control, an introduction. Birkhauser, 2000.
E. Trélat. Contrôle optimal : théorie et applications. Vuibert, 2005.
T. Weber. Optimal control theory. The MIT press 2011.

Contacts

Contacts *(2000 characters)*

BELMILOUDI Abdelaziz, HADDOU Mounir, LEY Olivier

Other information

Other information

4 hours are dedicated to application(s) related to natural resource management.

Subject name: Reliability and Survival Analysis	**Code EC: DMA09-FMDV**
Number of hours per student: 40 hours	**ECTS Number: 3,5**
Reference Teacher: Jean-François DUPUY	

Generalities

Objectives *(2000 characters)*

Statistical modeling of duration or lifetime data (more commonly called “survival data”) constitutes an important field of statistical modeling, whose applications are found in many sectors: epidemiology and public health, clinical research, reliability, environment, economics, marketing… A fundamental characteristic of these data is the presence of censoring (i.e., only a partial information is available on the data). The objective of this course is to provide an introduction – as the field is vast – to the statistical methods of survival analysis. At the end of this course, students will be able to implement the most used tools in the field: non-parametric estimators and tests, parametric and semi-parametric regression models. They will be able to implement them in R (free and open source software), to evaluate their conditions of application, to interpret their outputs (and in particular, to give a reading accessible to a non-specialist in statistics).

Description *(2000 characters)*

Using concrete examples from various fields (e.g., marine biology, health economics, insurance), this course will introduce the class of generalized linear models (GLMs) and focus on two of the most useful models in this class: the logistic model and the Poisson model. Associated inference methods will be introduced: point estimation (maximum likelihood), construction of asymptotic confidence intervals and asymptotic hypothesis tests. Issues of model selection, overdispersion and/or excess zero (for the Poisson model), and prediction will also be addressed. The prediction of a K-class variable can be approached from a classification perspective. A method dedicated to classification will therefore be introduced: discriminant analysis. Tools for assessing the quality of a classifier will then be introduced: concepts of sensitivity, specificity, ROC curve, and cross-validation.

Requirements *(2000 characters)*

This course requires the following prerequisites: statistical inference, linear regression model, generalized linear regression models, statistical learning.

Course requirements and assessments

Teaching Language *(2000 characters)*

French (the course may be given in English if the presence of non-French-speaking students requires it).

Teaching methods *(500 characters)*

Each session is structured around a lecture section (introduction to the methodological and/or theoretical concepts that will form the theme of the session) followed by exercises (including exercises in R, a free and open-source software), allowing for the immediate application of the concepts introduced. Numerous examples using real data will be covered.
Group work topics will be proposed to students, allowing them to discover recent models and methods for survival analysis (e.g., joint models for longitudinal and survival data, Brier score, etc.).

Number of hours per course type: *(2000 characters)*

CM : 20
TD : 10
TP : 10
PR :
CONF:
Autres:

Evaluation *(200 characters)*

Students are assessed using a written examination - WE (to assess their level of understanding of the methodology and tools introduced in the course) and a group project. Coefficients: WE (3/4) and group project (1/4).

Bibliography

Bibliography *(2000 characters)*

O. Aalen, O. Borgan, H. Gjessing. Survival and event history analysis: a process point of view. Springer, 2008.

J.P. Klein, M.L. Moeschberger. Survival analysis: techniques for censored and truncated data. Springer, 2003.

T. Martinussen, T.H. Scheike. Dynamic regression models for survival data. Springer, 2006.

J. O'Quigley. Proportional hazards regression. Springer, 2008.

Contacts

Contacts *(2000 characters)*

Jean-François DUPUY, jean-francois.dupuy@insa-rennes.fr

Other information

Other information

5 hours are devoted to the societal aspects of statistical modeling (ethical aspects of processing regression data, processing medical data, bias issues).

Subject name: Optimisation under uncertainty	Code EC: DMA09-OI
Number of hours per student: 40 h	ECTS Number: 3.5
Reference Teacher: Jérémy Omer	

Generalities

Objectives *(2000 characters)*

This course provides an overview of all the optimisation courses in the Applied Mathematics (MA) specialisation through the application of several advanced methods traditionally described as 'decomposition methods': column generation and Benders decomposition. It also reinforces the link between the probability/statistics and optimisation courses in the specialisation. Its objectives are to
• provide perspective and maturity on the mathematical optimisation methods covered in the MA programme
• introduce the fundamental concepts of optimisation under uncertainty.
• put these techniques into practice during a long-term project that will lead to the development of a complex algorithm
• gain perspective on the societal consequences of mathematical modelling through contributions from the philosophy of science and the study of practical case studies

Description *(2000 characters)*

• Column generation method: Dantzig-Wolfe decomposition, description of the algorithm and proof of convergence, Branch-and-Price method for obtaining an integer solution
• Uncertainty models: probability distributions, value intervals, scenarios, historical data, Bertsimas set
• Introduction to different approaches to optimisation under uncertainty: stochastic programming, robust optimisation, probabilistic constraints, stochastic dynamic programming, online optimisation.
• Classic examples: newspaper salesman problem, location under uncertainty.
• Robust optimisation: solving simple problems with Bertsimas' formulation, mathematical programming models.
• Stochastic programming with recourse: mathematical properties, solving by generating cutting planes and Monte Carlo methods.
• Practical application in Julia
• Extension of S7 teaching on the ethical and societal issues of automated decision aid.

Requirements *(2000 characters)*

• Third and fourth year courses of optimisation: Continuous optimisation, Discrete optimisation and Operational research
• Second and third year courses of probability, and the third-year course on Markovian models
• Advanced skills in programming with Julia Language

Course requirements and assessments

Teaching Language *(2000 characters)*

Classes are in French, lecture notes are in English

Teaching methods *(500 characters)*

Most of the important concepts covered in the course will be addressed through students' work on a practical project.

Number of hours per course type: *(2000 characters)*

CM: 14h
TD: 14h
TP: 12h

Evaluation *(200 characters)*

Optimisation project and practical works with Julia language (80 %) and homework on ethical and societal concerns of mathematical modelling (20 %)

Bibliography

Bibliography *(2000 characters)*

[1] Ben-Tal, A., El Ghaoui, L., & Nemirovski, A. (2009). Robust optimization. Robust Optimization (Princeton).
[2] Birge, J. R., & Louveaux, F. (2011). Introduction to Stochastic Programming. New York, Springer.
[3] Kall, P., & Mayer, J. (2004). Stochastic Linear Programming: Models, Theory, and Computation. Springer.
[4] Shapiro, a., Dentcheva, D., & Ruszczyǹski, A. (2009). Lectures on stochastic programming: modeling and theory. SIAM Series on Optimization.

Contacts

Contacts *(2000 characters)*

jeremy.omer@insa-rennes.fr

Other information

Other information

4h ST2 (and 20% of the evaluation)

Subject name: Research Project	**Code EC: DMA09-PIR**
Number of hours per student: 48.00 h	**ECTS Number: 3.5**
Reference Teacher: Abdelaziz BELMILOUDI	

Generalities

Objectives *(2000 characters)*

The objective is to propose a discovery of the profession of researcher and its professional environment in an academic or industrial context.

Description *(2000 characters)*

A project exploring one of the themes favored by the student will be proposed by a senior researcher from an academic/industrial laboratory in Rennes. It is adapted to the skills acquired until then by the student.
It is requested to conduct an interview with a researcher from at least three different laboratories. The project can be accompanied by any initiative of discovery of the world of research (visit of academic or industrial laboratories, participation in meetings of follow-up of research projects, process of publication of a scientific article ...)

Requirements *(2000 characters)*

Strong academic results.

Course requirements and assessments

Teaching Language *(2000 characters)*

English/ French

Teaching methods *(500 characters)*

48.00h are reserved in the timetable of the semester. Each session is an opportunity to discuss with his tutor.

Number of hours per course type: *(2000 characters)*

CM:
TD:
TP:
PR:
CONF:
Autres: 48.00h

Evaluation *(200 characters)*

A report of not more than 25 pages in English. A 20 minutes defense in English.

Bibliography

Bibliography *(2000 characters)*

Each project is based on a specific bibliographic study

Contacts

Contacts *(2000 characters)*

Aziz.belmiloudi@insa-rennes.fr

Other information

Other information

Target audience:
A maximum of N engineering students with strong academic results, where N = E(20% of the current class).

Subject name: Business seminar	Code EC: DMA09-SE
Number of hours per student: 48	ECTS Number: 3.5
Reference Teacher: Jean-François DUPUY, Mounir HADDOU, Olivier LEY	

Generalities

Objectives *(2000 characters)*

This module is an open forum for stakeholders of the business world. It covers all semesters of the engineering curriculum and aims at providing the students a broad-spectrum engineering culture. This module will constitute a unique opportunity for students to discover the different career profiles of mathematical engineering. Through this module, the students will also acquire some useful technical, managerial and juridical skills and a solid operational expertise. Finally, this module will help the students raising their awareness to the challenges of sustainable development and to the societal aspects of their future profession of engineer.

Description *(2000 characters)*

In the 5th year, the module will offer (among others):

- Specific software training ; - some awareness to specific technical issues related to the profession of mathematical engineer (such as scoring, pricing…).

Requirements *(2000 characters)*

Course requirements and assessments

Teaching Language *(2000 characters)*

French

Teaching methods *(500 characters)*

Different kind of presentations and interventions.

Number of hours per course type: *(2000 characters)*

CM: 48
TD:
TP:
PR:
CONF:
Autres:

Evaluation *(200 characters)*

The assessment is based on some report delivery.

Bibliography

Bibliography *(2000 characters)*

Contacts

Contacts *(2000 characters)*

DUPUY Jean-François, HADDOU Mounir, LEY Olivier

Other information

Other information

Subject name: Rare events estimation and simulation	**Code EC: DMA09-SEER**
Number of hours per student: 40 hours	**ECTS Number: 3,5**
Reference Teacher : Jean-François DUPUY	

Generalities

Objectives *(2000 characters)*

The objective of this course is to provide an overview of rare event simulation and estimation methods, both from a methodological and application perspective. Particular emphasis will be placed on the estimation of rare event probabilities and on the estimation of extreme quantiles. At the end of this course, students will be able to implement the most common numerical algorithms and mathematical methods in the field. The course will be illustrated by case studies in various contexts: highly reliable complex systems, insurance, insurance risk management…

Description *(2000 characters)*

The course will focus on two aspects, one more probabilistic and focused on the following themes:

- FORM/SORM (First/Second Order Reliability Method): evaluation of a system's lifespan based on manufacturing factors (resistance) and load factors (stress). Applications to system reliability. Simulation of rare events.
- Three key algorithms: Monte Carlo methods, preferential sampling, and multi-level methods. Applications to computer security (tracing traitors), insurance (risk of ruin), computer science (queues), and hypothesis testing (probability of false positives).

the other more statistical (statistical modeling of extreme values) around the following themes:

- order statistics, quantile estimation, bootstrap
- maximum law, Fisher-Tippet-Gnedenko theorem
- characterization of domains of attraction
- inference in the Fréchet domain (Hill estimator; Weissman estimator; estimation of rare event probabilities)
- the case of censored data will provide a bridge to the methods covered in the “survival analysis” course.

Requirements *(2000 characters)*

This course requires the following prerequisites: inferential statistics tools, Markov models, random models of dynamic systems.

Course requirements and assessments

Teaching Language *(2000 characters)*

French (the course may be given in English if the presence of non-French-speaking students requires it).

Teaching methods *(500 characters)*

Each session is structured around a lecture section (introduction of the methodological and/or theoretical concepts that will be the theme of the session) followed by exercises (including exercises in R, free and open source software), allowing the immediate application of the concepts introduced. Numerous examples on real data will be covered.

Number of hours per course type: *(2000 characters)*

CM : 20
TD :
TP : 20
PR :
CONF:
Autres:

Evaluation *(200 characters)*

Students are assessed using a written exam - WE (to assess their level of understanding of the methodology and tools introduced in the course) and a group project. Coefficients: WE (1/2) and group project (1/2).

Bibliography

Bibliography *(2000 characters)*

J. Beirlant, Y. Goegebeur,J. Segers, J. Teugels. Statistics of Extremes, Theory and applications. Wiley, 2004.

J.A. Bucklew. Introduction to Rare Event Simulation. Springer-Verlag, 2004.

O. Ditlevsen, H.O. Madsen. Structural reliability methods. Department of mechanical engineering technical university of Denmark - Maritime engineering, 2004.

C. Robert, G. Casella. Méthodes de Monte-Carlo avec R. Springer-Verlag, 2011.

G. Rubino et B. Tuffin. Rare Event Simulation using Monte Carlo Methods. Wiley, 2009.

Contacts

Contacts *(2000 characters)*

Jean-François DUPUY, jean-francois.dupuy@insa-rennes.fr

Other information

Other information

5 hours are devoted to the societal aspects of statistical modeling (ethical aspects of processing data, bias issues).

Subject name: MA Specific Unit	Code EC: DMA09-SPEC
Number of hours per student: 24 h	ECTS Number: 2
Reference Teacher: Jean-François DUPUY, Mounir HADDOU, Olivier LEY	

Generalities

Objectives *(2000 characters)*

The objective of this module is to complement the curriculum with knowledge and practical experience from the business world.

This module provides several opportunities to establish connections between students and companies. The internship dating program and various presentations and conferences by industry professionals offer students new knowledge related to the business world and facilitate their future entry into the workforce.

Description *(2000 characters)*

The "Career Days" event allows students to have several quick interviews with different companies. Conferences given by industry professionals cover various topics related to the MA program.

Requirements *(2000 characters)*

This module involves active participation and strong involvement in events, presentations, and conferences related to the business world.

Course requirements and assessments

Teaching Language *(2000 characters)*

French or English depending on the speaker from the dusiness world

Teaching methods *(500 characters)*

Cliquez ou appuyez ici pour entrer du texte.

Number of hours per course type: *(2000 characters)*

CM:
TD:
TP:
PR:
CONF:
Autres: 24 h

Evaluation *(200 characters)*

Validation depending on the student attendance and involvement

Bibliography

Bibliography *(2000 characters)*

Cliquez ou appuyez ici pour entrer du texte.

Contacts

Contacts *(2000 characters)*

Mounir HADDOU, mounir.haddou@insa-rennes.fr

Other information

Other information

Some activities and conferences are shared with the "company seminar" module.

Nom de la matière : Allemand	**Code EC: EC-HUMF09-ALL**
Volume horaire total par étudiant: 21heures	**Nombre crédits ECTS :**
	1,5 ECTS
Responsable(s) : Cecile Hölzner-Jacques	

Généralités

Objectives, aims *(2000 caracters)*

Targeted skills:
Mastering a foreign language
Ability to communicate/progress/work in an international and intercultural context
Cultural openness
Communicating/interacting with others, working in a team
Working autonomously
German Level A1: Acquiring the basics of the German language. Be able to understand and hold a simple conversation about everyday life.
German Level A2-B1: Be able to communicate in German, acquire intercultural skills, demonstrate cultural openness. Work in a group on a project, speak up.
German Level B2/C1: Work in a group on a project, speak up, communicate in German, acquire intercultural skills, acquire basic scientific and technical vocabulary. Ask questions, become a responsible engineer, think about the world of tomorrow in an international context.

Description *(2000 caracters)*

Practising written and oral comprehension. Developing oral expression through exercises in small groups and whole-class discussions. Acquire everyday German vocabulary for daily life and professional life.
German Level A2-B1: Grammar revision, consolidate knowledge. Practise reading and listening comprehension using multimedia resources. Develop oral expression skills through small group exercises, presentations or whole class discussions. Prepare students to progress independently in languages. Preparing mobility.
German B2-C1: Practise reading and listening comprehension using multimedia resources. Acquire technical and scientific German vocabulary. Develop oral expression skills through small group exercises, presentations or whole class discussions. Use and improve German language skills in the context of a project. Preparing mobility.

Pré-requis *(2000 caractères)*

German Level A1: none

German Level A2-B1: mastery of the basics of German (A2), second foreign language at secondary school (B1)

German B2-C1: good language skills, first foreign language or bilingual class at secondary school, ABIBAC

Modalités du cours et des évaluations

Langue d'enseignement *(2000 caractères)*

Cliquez ou appuyez ici pour entrer du texte.

Modalités d'enseignement *(500 caractères)*

1.5–2 hours of classes per week.
IAutonomous study time: 14-16 hours Total: 35 hours. Students are encouraged to read German newspapers regularly and watch videos, series and films, in addition to the work assigned between sessions.

Volume horaire par type de cours : *(2000 caractères)*

CM :
TD : 19 hours for the first cycle, 21 hours for the second cycle.
TP :
PR :
CONF :
Autres :
Autonomous study time: 14-16 hours
7 hours of optional project work in the second cycle

Modalités d'évaluation / coefficient *(200 caractères)*

Continuous assessment, oral examination

Bibliographie

Bibliographie *(2000 caractères)*

MOODLE course page
Deutsch für Ingenieure, Maria Steinmetz/Heiner Dintera, VDI/Springer Vieweg, 2014
Deutsch Perfekt, periodical
online: Deutsche Welle, ARD, Der Spiegel, FAZ, die Zeit, das Handelsblatt, VDI (Verein Deutscher Ingenieure), Nachrichten, ZDF Logo
French-German dictionary le visuel, Editions de la Martinière
Übungsgrammatik für die Mittelstufe Hueber-Verlag
Na also! Waltraud Legros, Ellipses
multimedia resources

Contacts

Contacts *(2000 caractères)*

Cecile Hölzner-Jacques : cecile.holzner-jacques@insa-rennes.fr

Autres

Autres informations

Cliquez ou appuyez ici pour entrer du texte.

Subject name: ANGLAIS / TOEIC	Code EC: EC-HUM09-ANGL-TOEIC
Number of hours per student: 20 h	ECTS Number: 1.5
Reference Teacher: Philippe LE VOT	

Generalities

Objectives *(2000 characters)*

Improving communication skills in everyday life situations as well as in company and business context.
Obtaining or reinforcing the B2 level requested by the CTI.
Obtaining 800 score at the final TOEIC test.

Description *(2000 characters)*

Learning by doing : students will have to be able to speak and listen, write a document while showing they can solve problems, reason, convince and demonstrate in an articulate manner.
Expressing oneself accurately and fluently : students will engage in activities requiring creative and reactive skills such as debates, role-plays, individual oral Power Point presentations, projects, based on scientific topics and current events.

Requirements *(2000 characters)*

Not having already taken and passed the TOEIC test during the previous two years
B1/B2 level advised

Course requirements and assessments

Teaching Language *(2000 characters)*

Teaching methods *(500 characters)*

Each class lasts two hours and most classrooms are equipped with video and audio. A multimedia lab and computer rooms are also available for the students to work in a stimulating environment.

Teaching resources include press articles, audio and video documents (TV reports, extracts from films and series)as well as the Internet. B2 level tests are also taken throughout the course.

Number of hours per course type: *(2000 characters)*

CM:
TD: 20 heures
TP:
PR:
CONF:
Autres:

Evaluation *(200 characters)*

Final mark based on : TOEIC score at final exam + attendance (more than 4 non justified absences result in 0/20 mark).

Bibliography

Bibliography *(2000 characters)*

English grammar in Use, Intermediate Edition (CUP)
Robert and Collins bilingual dictionary or Collins Cobuild

Contacts

Contacts *(2000 characters)*

Other information

Other information

5th year students who haven't already passed their TOEIC

INSA RENNES : 2025/2026

Course Name: ENGLISH

Course Code: EC-HUM09-ANGL-CONV

Total Student Workload: 10 hours

ECTS Credits: 1.5

Instructor(s): Philippe Le Vot

General Information

This course is intended for 5th-year students who have already obtained their TOEIC certification (B2 level required by the CTI). At the start of the module, students choose between two options:

• ECIU Courses (European online university). These allow students to register for courses delivered by our European university partners and compare different approaches to engineering.

• Audio or video project/challenge (production of an individual or group final product), based on a common theme that changes every year.

Description

The courses offered on the ECIU European platform cover a very wide range of specialities and allow our students to participate in micro-challenges, take courses taught by a European network of partner universities, and compare perspectives on the engineering world.

Prerequisites

• A strong command of the 3rd- and 4th-year English curriculum is required.

Teaching and Assessment Methods

Language of Instruction: English

Teaching Method: Self-directed learning. Students choose a module and validate it with the European university offering the course. This is carried out under the supervision and in collaboration with the internal ECIU team at INSA Rennes.

Course Type and Hours:

Tutorials (TD): 10 hours

Assessment:

The final grade is the grade awarded by the institution responsible for the selected module.

Bibliography

Only reference:

https://www.eciu.eu/

Contacts

plevot@insa-rennes.fr

Ellea.Lhermite@insa-rennes.fr (ECIU support at INSA)

INSA RENNES : 2025/2026

Course Name: ENGLISH

Course Code: EC-HUM09-ANGL-CONV

Total Student Workload: 10 hours

ECTS Credits: 1.5

Instructor(s): Philippe Le Vot

General Information

This course is intended for 5th-year students who have already obtained their TOEIC certification (B2 level required by the CTI). At the start of the module, students choose between two options:

• ECIU Courses (European online university). These allow students to register for courses delivered by our European university partners and compare different approaches to engineering.

• Audio or video project/challenge (production of an individual or group final product), based on a common theme that changes every year.

Description

The courses offered on the ECIU European platform cover a very wide range of specialities and allow our students to participate in micro-challenges, take courses taught by a European network of partner universities, and compare perspectives on the engineering world.

Prerequisites

• A strong command of the 3rd- and 4th-year English curriculum is required.

Teaching and Assessment Methods

Language of Instruction: English

Teaching Method: Self-directed learning. Students choose a module and validate it with the European university offering the course. This is carried out under the supervision and in collaboration with the internal ECIU team at INSA Rennes.

Course Type and Hours:

Tutorials (TD): 10 hours

Assessment:

The final grade is the grade awarded by the institution responsible for the selected module.

Bibliography

Only reference:

https://www.eciu.eu/

Contacts

plevot@insa-rennes.fr

Ellea.Lhermite@insa-rennes.fr (ECIU support at INSA)

Subject name: CHINESE LV2-LV3	**Code EC: EC-HUMF09-CHI**
Number of hours per student: 21 hours	**ECTS Number: 1,5**
Reference Teacher: Cécile Hölzner-Jacques	

Generalities

Objectives *(2000 characters)*

Targeted skills:

- Mastering a foreign language
- Ability to communicate/develop/work in an international and intercultural context
- Cultural openness
- Communicating/interacting with others, working in a team
- Working independently
- Acquiring the basics of the Chinese language, essential structures and vocabulary
- Comprehension, expression, pronunciation
- Using the language in everyday contexts.

Description *(2000 characters)*

Oral skills:
Corrective phonetics (pinyin system),
Listening to and analysing simple texts and complex sentences,
Oral exercises (learners with each other / learners with teacher)
Learning new characters (pronunciation and tone accentuation).

Written skills:
Theme/version
Written production of simple texts and complex sentences,
Learning and reinforcement of grammatical mechanisms and vocabulary for oral and written production,
Learning new characters (stroke order, keys),
Reading and analysis of texts, commentary on texts.

Requirements *(2000 characters)*

Chinese 1: None
Chinese 2: Completion of Chinese 1
Chinese 3: Completion of Chinese 2

Course requirements and assessments

Teaching Language *(2000 characters)*

Teaching methods *(500 characters)*

Reading lesson texts (in characters), rewriting new characters, exercises applying grammar points, lexical and morphological points, theme and version exercises...

Number of hours per course type: *(2000 characters)*

CM:
TD: 1h30
TP:
PR:
CONF:
Autres:

Evaluation *(200 characters)*

S1: Final mark
S2: Oral examination

Bibliography

Bibliography *(2000 characters)*

1. Chinese as spoken in China, Bernard Allanic, Presses Universitaires de Rennes, 2009
2. Contemporary Chinese, WU Zhongwei, Sinolingua, 2010
3. Experiencing Chinese, ZHANG Rumei, AI Xin, Higher Education Press, 2006
Chinese Language Method (Second Level), Zhitang Yang-Drocourt - Liu Hong – Fan Jianmin
Short Stories for Learning Mandarin Chinese, Zhang Xiaoli, 2025
Standard Course HSK Workbook, Jiang Liping
Other tools will complement these basic textbooks to provide students with a wide range of practical exercises.

Contacts

Contacts *(2000 characters)*

Other information

Other information

Learning Chinese isn't just about tones and characters. It's about connection — to a culture, to people, and to the stories that make language come alive.

Subject name: French foreign language	**Code EC: EC-HUMF09-FLE**
Number of hours per student: 21 hours (or 2 x 21 hours for the Exchange programme)	**ECTS Number: 1,5**
	3 credits for the Exchange
Reference Teacher: FOURE Dominique	

Generalities

Objectives *(2000 characters)*

The various activities in the FLE and FOS (French for Specific Purposes) programme aim to develop optimal language proficiency and the use of language as a cultural and intercultural vehicle, a tool for work and communication adapted to the context. Students will develop their autonomy through group work and individual work.
Targeted skills/humanities (SHS): ▪ Knowing oneself, managing oneself physically and mentally▪ Working, learning and developing independently▪ Interacting with others, working in a team▪ Demonstrating creativity, innovation and initiative▪ Acting responsibly in a complex world▪ Developing in a professional and social environment▪ Working in an international and intercultural
context

Description *(2000 characters)*

Level A1/A2
1- Language, culture and communication: Help learners feel comfortable in all everyday situations. Language learning is organised around observing how the language works, practising a variety of activities in class and carrying out projects in real or simulated contexts to promote autonomy.

2- Scientific and academic French: Facilitate integration into scientific studies, student life and social life.

Level B1/B2
1- Language, culture and communication: Help learners express themselves fluently in writing and orally on a wide range of general and specialised topics.
Key themes: Studying and living in France/ Understanding and exercising critical thinking in various fields: current affairs/history/art/science and technology, urban planning, the environment, etc.
Social sciences and humanities: socio-ecological transition, business and innovation.

2- Preparation for DELFB2 or DALFC1, compulsory French language diploma required to obtain an engineering degree**.**

Level B2/C1
1- Interculturality - Study of European and international current affairs and in-depth exploration of issues related to SHS
- Communicate and interact
- Decode intercultural references in speech, attitudes and behaviour
- Put one's values, beliefs and behaviour into perspective
- Integrate cultural diversity into group work

2- Professional French
- Prepare effectively for finding an internship or job
- Understand complex issues within the company
- Master societal, political, economic, environmental, ethical and philosophical aspects, etc.
- Act responsibly in the professional world

Requirements *(2000 characters)*

None
Courses range from beginner to advanced levels.
Each student will be placed in a group corresponding to their level and needs
- based on a test at the beginning of the year for new entrants
- based on the level acquired and assessed the previous year for existing students

Course requirements and assessments

Teaching Language *(2000 characters)*

Learners are trained and assessed on the five skills recognised by the Common European Framework of Reference for Languages (CEFR).

Teaching methods *(500 characters)*

Language, communication and intercultural skills are tailored to the target level and the needs of the group (indicated in the group code).

Number of hours per course type: *(2000 characters)*

CM:
TD:
TP:
PR:
CONF:
Autres:

Evaluation *(200 characters)*

Continuous assessment in line with the skills to be validated: CE, CO, PE, PO
INSA student programme: 21 hours/semester (1.5 credits)
Exchange programme: Students studying for a semester at INSA Rennes have the opportunity to obtain a total of 4 credits
- 1 Language Project (7 hours/semester) = 1 ECTS
- 2 FLE courses (2X21 hours/semester) e.g. Language, Culture and Communication + Interculturality

Bibliography

Bibliography *(2000 characters)*

Materials selected by the teacher based on the level and objectives to be achieved

Contacts

Contacts *(2000 characters)*

Dominique.foure@insa-rennes.fr

Other information

Other information

https://fle.insa-rennes.fr/

Subject name: ITALIAN LV2-LV3	**Code EC: EC-HUMF09-ITA**
Number of hours per student: 21h	**ECTS Number: 1,5**
Reference Teacher: Cécile HÖLZNER-JACQUES	

Generalities

Objectives *(2000 characters)*

Targeted skills:
Mastering a foreign language
Ability to communicate/develop/work in an international and intercultural context
Cultural openness
Communicating/interacting with others, working in a team
Working independently

Level 1 beginner: Introducing Italian language and culture, expressing ideas in writing and orally.
Level 2 advanced beginner: By the end of the course, students should be able to converse and write in Italian.
Level 3 intermediate: Give students the opportunity to explore topics related to art, civilisation, literature and cinema in greater depth.

Description *(2000 characters)*

Oral expression and comprehension: reading the course material with phonetic and grammatical corrections with the teacher, reading the situations found in the text, watching films and reading literary texts and press articles.
Written expression and comprehension: doing the exercises in the text with particular attention to difficulties, summarising the situations without the text available and the films studied.

Requirements *(2000 characters)*

Beginner level: none.
Advanced beginner level A2: must have attended the beginner Italian course.
Intermediate level B1/advanced level B2: must have a good knowledge of the Italian language.

Course requirements and assessments

Teaching Language *(2000 characters)*

Italian language

Teaching methods *(500 characters)*

The course will cover:.
Grammar concepts;.
Exercises to understand basic linguistic mechanisms;.
Building vocabulary using keywords and translations;.
Presentations and discussions on given topics;.
Asking questions and knowing how to respond;.
Creating dialogues, stories, and discussions based on given keywords;
(All of this will be adapted to the average level of the course.)

1.5 hours of face-to-face lessons per week, 21 hours per semester.
Personal work: 14 hours Read the texts provided in the handouts; 7 hours create a dialogue or short story using the keywords provided and express yourself with them.

Number of hours per course type: *(2000 characters)*

CM:
TD: 21h
TP:
PR:
CONF:
Autres:

Evaluation *(200 characters)*

S1: Final mark
S2: Oral examination

Bibliography

Bibliography *(2000 characters)*

Loesher Archivio di Grammatica, https://italianoperstranieri.loescher.it/archivio-di-grammatica

Harraps, Italian Express Method, Vittoria Bowles and Paul Coggle

Texts taken from Italian novels, poems, essays, daily and weekly newspapers, and films by famous directors

Contacts

Contacts *(2000 characters)*

Paolo Procesi: Paolo.Procesi@insa-rennes.fr

Other information

Other information

Subject name: Japanese	**Code EC: EC-HUMF09-JAP**
Number of hours per student:	**ECTS Number: 1.5**
Reference Teacher: Cécile Hölzner-Jacques	

Generalities

Objectives *(2000 characters)*

Targeted skills:

Mastering a foreign language
Ability to communicate/develop/work in an international and intercultural context
Cultural openness
Communicating/interacting with others, working in a team
Working independently

Beginner level (A1):

-Awareness of specific features (phonetics, syntax)
-Discovering Japanese culture, traditions and customs
-Learning two writing systems (Hiragana and Katakana)
-Mastering spoken Japanese in everyday situations.

Intermediate level (A2):

- Introduction to ideograms (30-60 kanji)
- Reading simple texts (using manga, etc.)
- Writing simple texts
- Mastering spoken Japanese in everyday situations.

Advanced level (B1, B2):

- Learning kanji (60-200)
- Acquiring four skills (reading, listening, writing and speaking) for travelling and studying in Japan.

Description *(2000 characters)*

Description (2000 characters)
Level 1 beginner (A1):
- Improvement of Hiragana and Katakana
- Mastery of Japanese in everyday situations (Marugoto A1).
Lesson 3: Me_ Nice to meet you
Lesson 4: Me_ There are three of us in my family
Lesson 5: Food_ What kind of food do you like?
Lesson 6: Food_ Where shall we eat?
Lesson 7: The house_ It's a three-room flat
Lesson 8: The house_ What a beautiful room you have!

Lesson 9: Everyday life_ What time do you get up?
Lesson 10: Everyday life_ When are you available?
Level 2 Intermediate (A2):
- Continuation of the Marugoto textbook (Lessons 11 to 18)
- Learning new basic grammar points (past tense, potential tense, volitional tense, etc.)
- Improving and discovering new particles (で、に、から/まで, etc.)
- Discovering and learning 30-60 kanji
- Reading and writing simple texts
- Learning to communicate in everyday situations.

Intermediate level (B1, B2):

- Reading manga
- Acquiring four skills (reading and listening comprehension, writing and speaking).

Requirements *(2000 characters)*

Beginner level A1: none.
Beginner level A2: completion of beginner level A1.
Intermediate/advanced level: completion of beginner levels A1/A2.

Course requirements and assessments

Teaching Language *(2000 characters)*

Teaching methods *(500 characters)*

Teaching takes the form of tutorials. Each session consists of an explanation of concepts, which are then illustrated with examples and conversation exercises in which the students participate.

Number of hours per course type: *(2000 characters)*

CM:
TD:21h
TP:
PR:
CONF:
Autres:

Evaluation *(200 characters)*

A1
S1 and S2: Final mark

A2 and B1
S1: Final mark
S2: Oral examination

Bibliography

Bibliography *(2000 characters)*

Level 1 beginner (A1): Margoto A1, Japan Foundation, 2013, Japan.

Level 2 beginner (A2): Margoto A2, Japan Foundation, 2014, Japan.

Contacts

Contacts *(2000 characters)*

Other information

Other information

Subject name: Intercultural Modul	**Code EC: EC-HUMF09-LV2-OI**
Number of hours per student: 21h par semestre	**ECTS Number: 1.5**
Reference Teacher: Cécile Hölzner-Jacques	

Generalities

Objectives *(2000 characters)*

The course aims to develop students' fluency in both written and spoken communication while fostering philosophical reflection. It not only enhances reading, listening, and expressive skills but also cultivates critical thinking and confident public speaking. Particular emphasis is placed on rigorous reasoning, clear argumentation, and the ability to connect philosophical inquiry with linguistic precision.

Description *(2000 characters)*

Each semester is devoted to a specific philosophical concept. For the first semester of 2025, the theme is *violence*.
The course is divided into two distinct parts. The first part focuses on language development. Each session begins with a warm-up activity designed to encourage oral participation and group interaction. Students engage in creative writing exercises — such as recounting a memory or imagining a story — to stimulate imagination and improve expressive skills. Regular reading of newspaper articles helps strengthen reading comprehension, pronunciation, and vocabulary.
The second part of the course is dedicated to project work, which constitutes the final graded assignment. Through these projects, students synthesize language practice and philosophical reflection, applying both to a concrete and personally meaningful topic.

Requirements *(2000 characters)*

Students should be able to express themselves in English with a reasonable degree of confidence. Mistakes in grammar or pronunciation are not a problem, but a solid foundation in vocabulary and basic grammar is necessary to follow the course. The class usually includes both bilingual students and others with more limited proficiency, so the activities are designed to allow everyone to participate meaningfully and progress at their own pace.

Course requirements and assessments

Teaching Language *(2000 characters)*

The course is conducted primarily in English, although French may occasionally be used for clarification or discussion when necessary.

Teaching methods *(500 characters)*

This is not a traditional lecture-based course but an interactive class built around students 'interests. It is designed as a space for expression and reflection. Written and video materials are regularly used, and students are encouraged to take an active role through role-playing activities and short theatrical performances.

Number of hours per course type: *(2000 characters)*

CM:
TD: 20 h par semestre
TP:
PR:
CONF:
Autres:

Evaluation *(200 characters)*

Assessment is based on attendance and participation, but mainly on a creative end-of-term project demonstrating linguistic skills and critical thinking, completed individually or in groups

Bibliography

Bibliography *(2000 characters)*

Books

Camus, Albert. *The Stranger*. Translated by Stuart Gilbert. New York: Vintage Books, 1942.
Dostoevsky, Fyodor. *Crime and Punishment*. Translated by Constance Garnett. New York: Modern Library, 1866.
Flock, Elizabeth. *The Furies: Women, Vengeance, and Justice*. New York: Harper, 2024.
Malm, Andreas. *How to Blow Up a Pipeline: Learning to Fight in a World on Fire*. London: Verso Books, 2021.
Manne, Kate. *Down Girl: The Logic of Misogyny*. Oxford: Oxford University Press, 2017.
Motz, Anna. *If Love Could Kill: The Myths and Truths of the Women Who Commit Violence*. New York: Knopf, 2024.
Thoreau, Henry David. *Civil Disobedience*. Boston: David R. Godine, 1849.
Zinn, Howard. *A People's History of the United States*. New York: Harper & Row, 1980.

Articles and Essays

King, Martin Luther, Jr. "Letter from Birmingham Jail." April 16, 1963.
Schwartz, Alexandra. "When Women Commit Violence." *The New Yorker*, 2024.
Zinn, Howard. "The Problem is Civil Obedience." Speech delivered at Johns Hopkins University, Baltimore, November 1970.

Films and Television

Bong Joon-ho, dir. *Parasite*. Seoul: Barunson E&A, 2019.
Coen, Joel, and Ethan Coen, dirs. *Fargo*. Los Angeles: PolyGram Filmed Entertainment, 1996.
Coen, Joel, and Ethan Coen, dirs. *No Country for Old Men*. Los Angeles: Miramax Films, 2007.
Demme, Jonathan, dir. *The Silence of the Lambs*. Los Angeles: Orion Pictures, 1991.
Fincher, David, dir. *Gone Girl*. Los Angeles: 20th Century Fox, 2014.
Fincher, David, dir. *The Girl with the Dragon Tattoo*. Culver City: Columbia Pictures, 2011.
Fincher, David, dir. *Zodiac*. Los Angeles: Paramount Pictures, 2007.
Gilligan, Vince, creator. *Breaking Bad*. Los Angeles: AMC, 2008–2013.
Kelly, Richard, dir. *Donnie Darko*. Los Angeles: Newmarket Films, 2001.
Lanthimos, Yorgos, dir. *The Killing of a Sacred Deer*. London: A24, 2017.
Lynch, David, and Mark Frost, creators. *Twin Peaks*. Los Angeles: CBS Television Distribution, 1990–1991, 2017.
Martin, Steve, and John Hoffman, creators. *Only Murders in the Building*. Los Angeles: Hulu, 2021–.
Miller, George, dir. *Furiosa: A Mad Max Saga*. Burbank: Warner Bros., 2024.
Miller, George, dir. *Mad Max: Fury Road*. Burbank: Warner Bros., 2015.
Penhall, Joe, creator. *Mindhunter*. Los Gatos: Netflix, 2017–2019.
Pizzolatto, Nic, creator. *True Detective*. Los Angeles: HBO, 2014.
Tarantino, Quentin, dir. *Kill Bill: Vol. 1* and *Kill Bill: Vol. 2*. Los Angeles: Miramax Films, 2003–2004.
Wan, James, dir. *Saw*. Santa Monica: Lions Gate Films, 2004

Contacts

Contacts *(2000 characters)*

Other information

Other information