

Subject name: Electronics: Discrete devices	Code EC: GPM06-Elec
Number of hours per student: 66h	ECTS Number: 4.5
Reference Teacher: Alexandre Beck	

Generalities

Objectives (2000 characters)

• Analyse and design op-amp-based circuits • Filters basic design rules and scaling of analog filters (active and passive) • Understand the operating principle of fundamental semiconductor-based devices (junction diode, bipolar junction transistor and field-effect transistor) and their current-voltage characteristics • Know how to bias an active electronic circuit • Set and use small signal model for transistor-based basic amplifier (one and multistage)

Description (2000 characters)

1. Amplifiers in linear regime: amplification, op-amp, real op-amp characteristics, op-amp based fundamental circuits, voltage and current controlled sources. 2. Analog filters : template, conception and design of filters, filter order and transfer function, practical implementation of filters. 3. Semiconductor active devices: junction diode, bipolar junction transistor (BJT), field-effect transistor (FET) (operating principles, current-voltage characteristics 4. Semiconductor devices in linear regime : biasing, small signal transistor equivalent model (hybrid pi-model) 5. Transistor amplifiers : One and multistage amplifiers, fundamentals circuits (common emitter, emitter-follower, common base,...), impedance matching 6. Differential pair: operating principle, common mode and differential mode in small signal assumption, common-mode rejection ratio

Requirements (2000 characters)

Knowledge of linear electrical network in harmonic regime

Course requirements and assessments

Teaching Language (2000 characters)

French

Teaching methods (500 characters)

Lectures, tutorials, personal work. Application of theoretical notion in lab works and a 12h project

Number of hours per course type: (2000 characters)

CM: 18h

TD: 18h

TP: 18h

PR: 12h

CONF:

Autres:

Evaluation (200 characters)

Written evaluation (2h) / Lab works and project evaluation (1/1)

Bibliography**Bibliography (2000 characters)**

SEDRA/SMITH, Microelectronic circuits, Oxford
F. Manneville/J. Esquieu Electronique tomes 1 et 2, Dunod
J. Blot, Electronique linéaire, Dunod
A.P. Malvino/D.J. Bates, Principes d'électronique, Dunod

Contacts**Contacts (2000 characters)**

alexandre.beck@insa-rennes.fr

Other information

Other information

Cliquez ou appuyez ici pour entrer du texte.

Subject name : Ceramics	Code EC : GPM06-CERA
Number of hours per student : 14h	ECTS Number : 1
Reference Teacher : GLORANT Thierry	

Generalities

Objectives (2000 characters)

Essential knowledge of ceramic materials: processing methods and physical properties.

Description (2000 characters)

Definition. General overview. Classification of ceramics. Traditional and technical ceramics.
 Examples of simple and complex ceramics.
 Ceramic processing: sintering. Definition of the different stages of sintering.
 Processing procedures by deposition (CVD, PVD).
 Physical mechanisms of the mechanical behaviour of ceramics: ductility, frailty, stress intensity factor, creep mechanisms.
 Electric, magnetic and thermal properties.

Requirements (2000 characters)

Basic knowledge in Crystallography. Materials Thermodynamics. Structural Metallurgy.

Course requirements and assessments

Teaching Language (2000 characters)

French

Teaching methods (500 characters)

One hour per week.

Number of hours per course type: (2000 characters)

CM : 12h

TD :2h

TP :

PR :

CONF :

Autres :

Evaluation (200 characters)

One-hour written examination.

Bibliography

Bibliography (2000 characters)

W.D. KINGERY, H.K. BOWEN, DR UHLMANN, Introduction to Ceramics, John Wiley et Sons, New-York (1976), ISBN 0.471.47860.1

J.L. CHERMANT, Caractérisation des poudres et des céramiques, Hermès, Paris (1992), ISBN 2.86601.307.7

L.L. HENCH, R.W. GOULD, Characterization of Ceramics, M. Dekker Inc, New-York (1971), ISBN 0.8247.1302.8

Contacts

Contacts (2000 characters)

GLORiant Thierry

Other information

Other information

Cliquez ou appuyez ici pour entrer du texte.

Subject name : Corrosion	Code EC : GPM06-CN
Number of hours per student : 9h	ECTS Number : 1
Reference Teacher : GORDIN Doïna	

Generalities

Objectives (2000 characters)

Basics of wet and hot corrosion.

Description (2000 characters)

Study of creep phenomena - Study of fatigue phenomena - Corrosion phenomena and their morphologies - Electrochemistry review: electrode and cell potentials, Pourbaix diagrams - Laboratory study methods: current-potential curves, polarization resistance, impedance measurements - Concrete cases of corrosion: galvanic corrosion, differential aeration corrosion, pitting corrosion, stress corrosion cracking - Corrosion protection: choice of materials, coatings, anodic or cathodic protection.

Requirements (2000 characters)

Electrochemistry (as studied during the first two years at INSA).

Course requirements and assessments

Teaching Language (2000 characters)

French

Teaching methods (500 characters)

Lectures

Number of hours per course type: (2000 characters)

CM : 9h

TD :

TP :

PR :

CONF :

Autres :

Evaluation (200 characters)

One-hour written examination.

Bibliography

Bibliography (2000 characters)

J. PHILIBERT A. VIGNES Y. BRECHET P. COMBRADE " Métallurgie du minerai au matériau " Ed Masson.- D. LANDOLT " Corrosion et chimie de surfaces des métaux ", Ed. Presses .Polytechniques et Universitaires Romandes.- J.J. LAMOUREUX "Précis de corrosion " Ed. Masson.- J.C. SCULLY " Corrosion Protection : principes fondamentaux " Ed. Masson.- C. VARGEL " Corrosion de l'aluminium ", Ed. Dunod.

Contacts

Contacts (2000 characters)

Doïna GORDIN

Other information

Other information

Cliquez ou appuyez ici pour entrer du texte.

Subject name : Electronics	Code EC : GPM06-ELEC
Number of hours per student : 66h	ECTS Number : 4
Reference Teacher : BECK Alexandre	

Generalities

Objectives (2000 characters)

- Understand and analyse operational amplifier-based circuits
 - Design a filter template and the circuit that achieves this function (active and passive devices)
 - Understand and know the operating principles of the main semiconductor-based electronic devices (Junction diode, bipolar transistor (BJT), MOS transistor and field effect transistor)
 - Know the basic current-voltage relationship of these devices
 - Bias an active electronic circuit
- Determine and analyze small-signal equivalent circuit of single and multi-stage amplifier.

Description (2000 characters)

- 1.Linear amplification : amplifier function, operational amplifier (op-amp), real op-amp characteristics, basic op-amp circuits, controlled voltage and current sources
- 2.Analog filters: Filter template and design, transfer function, Bode diagram, order, filter implementation
- 3.Semiconductor active devices : Diode, bipolar junction transistors, field effect transistors, MOSFET (operating principles, current-voltage characteristics)
- 4.Linear semiconductor devices and amplifier circuits: Biasing, small-signal equivalent circuit at steady state
- 5.Amplification : single stage and multistage amplification, fundamental circuits, impedance matching
- 6.Differential pair: operating principle, Common and differential mode in large signal and small-signal approximation, main characteristics.

Requirements (2000 characters)

Basic knowledge of electrical engineering. Linear electrical circuits in continuous wave regime.

Course requirements and assessments

Teaching Language (2000 characters)

French

Teaching methods (500 characters)

Learning the course material, preparing and reviewing exercises. Practical application of the concepts covered in lectures and tutorials during practical sessions. Mini-project.

Number of hours per course type: (2000 characters)

CM : 18h

TD : 18h

TP : 18h

PR : 12h

CONF :

Autres :

Evaluation (200 characters)

A written examination on the lectures and tutorials (2h)

Lab works will be evaluated too (reports and final examination) and integrated to the final mark.

Bibliography**Bibliography (2000 characters)**

SEDRA/SMITH, Microelectronic circuits, Oxford
F. Manneville/J. Esquieu Electronique tomes 1 et 2, Dunod
J. Blot, Electronique linéaire, Dunod
A.P. Malvino/D.J. Bates, Principes d'électronique, Dunod

Contacts**Contacts (2000 characters)**

BECK Alexandre

Other information

Other information

Cliquez ou appuyez ici pour entrer du texte.

Subject name : Propagation of the EMW in anisotropic media	Code EC : GPM06-POMA
Number of hours per student : 24.00 h	Number of ECTS credits : 2
Reference Teacher : Olivier DURAND	

Generalities

Objectives (2000 characters)

Continuation of the study of propagation phenomena in anisotropic media. Study of applications of birefringence phenomena in optics and photonics.

Description (2000 characters)

Propagation of an EMW in a linear, homogeneous, anisotropic dielectric medium. Uniaxial media. Trajectory of light rays in uniaxial crystals. Birefringence (Spath prism, Wollaston prism, birefringent plate with parallel faces). Crystalline plates with polarizing retarders. Induced polarization (linear birefringence, Pockels and Kerr effects, action of a magnetic field, action of mechanical stress). Electro-optical switches. Rotational polarization (circular birefringence). Liquid crystal rotator. LCD screens.

Requirements (2000 characters)

Geometric optics and image formation. Mathematics of complex numbers and complex variable functions.

Course requirements and assessments

Teaching Language (2000 characters)

French

Teaching methods (500 characters)

Two hours of class per week. 15 hours total. 13 hours of tutorials.

Number of hours per course type: (2000 characters)

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

Evaluation (200 characters)

An exam on the course (2 hours)

Bibliography

Bibliography (2000 characters)

Eugène Hecht, Optique (Série Schaum). J.P. Perez, Optique géométrique et ondulatoire, (Masson)

Contacts

Contacts (2000 characters)

DURAND OLivier

Other information

Other information

Cliquez ou appuyez ici pour entrer du texte.

Subject name : Solid State Physics	Code EC : GPM06-PS
Number of hours per student : 34h	ECTS Number : 3
Reference Teacher : BOYER Soline et GUEZO Maud	

Generalities

Objectives (2000 characters)

This fundamental part of the course concerns the crystal lattice and the electronic properties of solids leading to the electronic properties of crystals (metals and insulators) as well as the band structure of semiconductors.

Description (2000 characters)

Crystalline Lattices: Symmetries and Special Lattices: Seven Crystal Systems and Fourteen Bravais Lattices / Simple Lattices: Simple Cubic, Body-Centered, Face-Centered, Diamond Structure, and Zinc Blend / Reciprocal Lattices: Basis, Cubic, Body-Centered, and Face-Centered Lattices, Brillouin Zone / Bloch Translation Theorem in the Direct and Reciprocal Lattices, Born-Von Kármán Conditions

Electrons in Solids: The Linear Crystal and Phonons / Properties of Free Electrons in a Crystal, the Concept of Density of States / Energy Bands in Solids, Fermi Level, Insulators and Conductors / Presentations of Real Bands: Symmetries of Wave Functions, Band Gaps, Valence and Conduction Bands / Electron Dynamics in Semiconductors / Population of Energy Bands / 2 types of charges carriers : electrons and holes

Requirements (2000 characters)

In mathematics:
3D differential equations, Space geometry, Calculation of Eigenvalues and eigenvectors.
Basic knowledge of wave functions and projections of an operator on a base.
3D Fourier transform.
In other fields:
Plane waves, overview of atomic orbitals, electrostatics and electromagnetism.

Course requirements and assessments

Teaching Language (2000 characters)

French

Teaching methods (500 characters)

Coursework and preparation for tutorial exercises, 3 hours per week.

Number of hours per course type: (2000 characters)

CM : 16h

TD : 18h

TP :

PR :

CONF :

Autres :

Evaluation (200 characters)

A 2-hour written exam.

Bibliography

Bibliography (2000 characters)

H. Mathieu, Physique des semiconducteurs et des composants optiques (Masson)

J. Singh, Optoelectronics , McGraw Hill Book Co

Ashcroft, Mermin, Solid State Physics (Sauders Company)

Kittel, solid state physics

Contacts

Contacts (2000 characters)

BOYER Soline et GUEZO Maud

Other information

Other information

Cliquez ou appuyez ici pour entrer du texte.

Subject name : Physics of semiconductor devices	Code EC : GPM06-SC
Number of hours per student : 28h	ECTS Number : 3
Reference Teacher : BERTRU Nicolas & LEVALLOIS Christophe	

Generalities

Objectives (2000 characters)

The module purpose is to introduce the main concepts of semiconductor physics and to address the operation of diodes based on metal-semiconductor junctions and P-N junctions.

Description (2000 characters)

Fermi statistics: concept of holes, level occupancy, doping and Fermi level. Carrier concentration with temperature.

Transport: Conduction current, diffusion current, general equations. Recombination and generation processes, continuity equations, minority carrier diffusion equations.

Schottky junction: Work function and electron affinity. Metal and semiconductor in contact. Electric field and potential. Depletion region and junction capacitance. I-V characteristics of the Schottky diode.

PN junction: Energy bands, diffusion potential of the junction. Thermodynamic equilibrium, electric field and potential. Depletion region and junction capacitance. Carrier injection. Continuity equation. Current-voltage characteristic of the junction.

Requirements (2000 characters)

- **In mathematics:** differential equations.
- **In other fields:** electrostatics.

Course requirements and assessments

Teaching Language (2000 characters)

Cliquez ou appuyez ici pour entrer du texte.

Teaching methods (500 characters)

Lectures

Number of hours per course type: (2000 characters)

CM : 14h

TD : 14h

TP :

PR :

CONF :

Autres :

Evaluation (200 characters)

A two-hour written exam.

Bibliography**Bibliography** (2000 characters)

Cliquez ou appuyez ici pour entrer du texte.

Contacts**Contacts** (2000 characters)

BERTRU N. & LEVALLOIS C.

Other information**Other information**

Cliquez ou appuyez ici pour entrer du texte.

Subject name : Thermodynamics of Materials	Code EC : GPM06-TM
Number of hours per student : 30	ECTS Number : 3
Reference Teacher : GLORANT Thierry	

Generalities

Objectives (2000 characters)

Basics of Thermodynamics as preparation for the lectures on materials. Topics: equilibrium in binary systems, material/environment interactions, processing and transforming process, thermodynamic model of metallic, ceramic and semiconductor systems.

Description (2000 characters)

Thermodynamic systems and functions (Reminder).
 Partial and integral molar quantities, activities and thermodynamic activity coefficients.
 Binary solutions, binary solution models, quasi-chemical approach of solid solutions.
 Thermodynamics and equilibrium diagrams of a binary system. Practical determination of thermodynamic quantities.
 Utilisation of thermodynamic databases.
 Overview of models for thermodynamics of materials.

Requirements (2000 characters)

Thermodynamics - Bachelor level (Physics and Chemistry).

Course requirements and assessments

Teaching Language (2000 characters)

French

Teaching methods (500 characters)

Revision of lecture notes. Completion of exercises (two - three hours per week).

Number of hours per course type: (2000 characters)

CM : 16h

TD 14h:

TP :

PR :

CONF :

Autres :

Evaluation (200 characters)

Three-hour written examination (no documents allowed).

Bibliography

Bibliography (2000 characters)

- A. PRINCE, ""Alby phase equilibra"" (1966) Elsevier Publishing Company - R.A. SWALIN, ""Thermodynamics of solids"" (1962) John Wiley and Sons, New-York.
- N.A. Gokcen, ""Thermodynamique"" (Traduction française) CIRP (Saint Denis).

Contacts

Contacts (2000 characters)

GLORiant Thierry

Other information

Other information

Cliquez ou appuyez ici pour entrer du texte.

Subject name : Physics Pratical work S6	Code EC : GPM06-TP
Number of hours per student : 24h	ECTS Number : 2.5
Reference Teacher : LETOUBLON Antoine	

Generalities

Objectives (2000 characters)

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Description (2000 characters)

Requirements (2000 characters)

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Course requirements and assessments

Teaching Language (2000 characters)

french

Teaching methods (500 characters)

Practical teaching

Number of hours per course type: (2000 characters)

CM :

TD :

TP :24h

PR :

CONF :

Autres :

Evaluation (200 characters)

practical work report

Bibliography

Bibliography (2000 characters)

Mentioned in each handout.

Contacts

Contacts (2000 characters)

LETOUBLON Antoine

Other information

Other information

Cliquez ou appuyez ici pour entrer du texte.

Nom de la matière : Allemand	Code EC: EC-HUMF06-ALL
Volume horaire total par étudiant: 21heures	Nombre crédits ECTS :
	1,5 ECTS
Responsable(s) : Cecile Hölzner-Jacques	

Généralités

Objectives, aims (2000 characters)

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 characters)

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.

Autonomous 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.

ENGLISH	Code EC: EC-HUM06-ANGL
Total number of hours per student : 28h	ECTS : 2
Supervisor : Philippe LE VOT	

General information

Objectives and Purposes

General Objectives:

Improve the ability to express oneself, understand, and interact in everyday situations, with a particular emphasis on professional and social life.

Linguistic Objectives:

Achieve or strengthen the B2 level (required for the validation of the engineering degree and defined by the CEFR).

Cliquez ou appuyez ici pour entrer du texte.

Description

- **Action-oriented approach to language learning:** Learning by doing: speaking and listening, writing documents while mobilizing the ability to solve, construct, demonstrate, and persuade.
- Express oneself with precision through rigorous use of syntax and phonology. Activities involving creativity and responsiveness, such as debates, role-playing, individual oral presentations with PowerPoint or Canva support, and projects, will be based on current, scientific, and societal topics.
- Development of specific skills related to the professional world:
 - Writing emails and abstracts linked to the EPA (Engineering Problem Analysis) course.
 - Notions of interculturality.
 - Sustainable development.

Prerequisites

A good mastery of the STPI program is essential: B1/B2 level.

Course and Evaluation Modalities

Language of Instruction

English

Teaching Methods

The classes are two hours long and take place in rooms equipped with projectors and sound systems. We also have two multimedia language labs and a Computer Resource Center to provide students with a stimulating teaching environment.

- Educational resources include press articles, audio, and video documents from the web.

- Regular personal work is required. Students are expected to remain curious and continue practicing beyond the classroom.

Hours by Course Type

- **Lectures (CM):**
- **Tutorials (TD):** 28 hours (14 sessions of 2 hours each)
- **Practical Work (TP):**
- **Research Projects (PR):**
- **Conferences (CONF):**
- **Others:**

Evaluation Methods / Coefficient

1 in-class presentation + 1 continuous assessment grade (average of different graded assignments)

Bibliography

Bibliography

Any English-language materials, whether technical or otherwise.

Contacts

Contacts

plevot@insa-rennes.fr

Subject name: CHINESE LV2-LV3	Code EC: EC-HUMF06-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: CREATIV	Code EC: EC-HUM06-creativ
Number of hours per student: 16h	ECTS Number: 1.5
Reference Teacher: Fanny GOURRET	

Generalities

Objectives (2000 characters) Cliquez ou appuyez ici pour entrer du texte.

The module aims to raise students' awareness of the challenges of innovation within companies and to place them in situations where they can generate ideas for launching new economic activities.

It serves as preparation for the *"Entrepreneurship & Innovation"* module in Semester 7.

Main learning outcomes:

- Understand the challenges and implications of an innovation strategy,
- Be able to use specific analytical tools and the associated vocabulary,
- Demonstrate creativity,
- Work effectively in a team: make collective decisions and produce deliverables within given deadlines.

Description (2000 characters)

Workshops are organized in project groups to enable students to:

- Explore inspiring practices through benchmarking,
- Identify opportunities and key challenges to be addressed,
- Develop innovative solutions using design thinking methods,
- Assess potential risks,
- Present and effectively pitch their project.

Requirements (2000 characters)

Non

Course requirements and assessments

Teaching Language (2000 characters)

french

Teaching methods (500 characters)

Cliquez ou appuyez ici pour entrer du texte.

- ☐ Work based on real cases of innovative companies (either in the start-up or development phase).
- ☐ Creative project built around an innovative idea (in groups).

Number of hours per course type: (2000 characters)

CM:

TD: 16

TP:

PR:

CONF:

Autres

Evaluation (200 characters)

Cliquez ou appuyez ici pour entrer du texte.

Continuous assessment (collective work)

Progress is evaluated through progress reports in the form of oral presentations.

Bibliography

Bibliography (2000 characters)

Cliquez ou appuyez ici pour entrer du texte.

Provided during the course

Contacts

Contacts (2000 characters)

Fanny GOURRET, Philippe MENKE

Other information

Other information

Cliquez ou appuyez ici pour entrer du texte.

Subject name: PHYSICAL EDUCATION (EPS) SEMESTER 6	Code EC: EC-HUM06-EPS
Number of hours per student: 24H	ECTS Number: 1
Reference Teacher: Gérard VAILLANT Yvan HINAULT Maïté LOSCHETTER	

Generalities

Objectives (2000 characters)

Aims

The program aims to contribute, through the practice of Physical, Sports, and Artistic Activities, to the education and development of future citizens. It seeks to foster individuals who are capable of managing their present and future health, communicating effectively, participating actively in group dynamics, demonstrating innovation, and showing adaptability in various contexts.

Learning Objectives

Upon completion, learners should be able to:

1. Manage their own learning and training processes in a structured and reflective manner.
2. Engage in and take responsibility for the organization and management of a group, a structure, or a collective project.
3. Take charge of their physical, mental, and social health as an ongoing process of well-being and self-regulation.

Description (2000 characters)

This course aims to develop students' motor, personal, social, and methodological competencies through the practice of physical, sports, and artistic activities. It fosters autonomy, adaptability, creativity, and responsibility in both individual and collective contexts.

Motor and Cultural Competencies: Master the technical and tactical fundamentals of the chosen activity. Adapt to varying play conditions, environments, and performance spaces. Develop specific physical qualities (endurance, flexibility, strength, speed) and psychological resources (focus, perseverance, stress management, confidence).

Personal Competencies: Take responsibility for one's long-term health and safety. Manage emotions and stress with self-control. Demonstrate innovation and creativity in practice. *Semester 6 focus:* comprehend the physiological principles for maintaining good health (preparation for effort, recovery, and regulation of exertion); Recognize one's strengths and weaknesses in order to use them most effectively.

Interpersonal and Social Competencies: Work effectively in teams—listen, communicate, motivate, and lead. Adopt an eco-citizen approach by respecting others, oneself, the environment, and equipment. *Semester 6 focus:* Adjust verbal and non-verbal communication to suit the group context.

Methodological Competencies: Manage complex projects by setting objectives, planning, and evaluating outcomes. Make informed decisions through observation, reflection, and feedback. *Semester 6 focus:* Commit to a learning project (evaluate one's initial level, identify areas for progression, gather information, and self-assess). Plan practice to achieve realistic goals

Requirements (2000 characters)

Cliquez ou appuyez ici pour entrer du texte.

Course requirements and assessments**Teaching Language (2000 characters)**

French

Teaching methods (500 characters)

Through original and varied situations, this course engages all of the student's resources — motor, cognitive, relational, emotional, and informational.

Through action and experience, students are confronted with complex problem-solving and decision-making processes.

This practice encourages students to take autonomous responsibility for their own health, understood as a state of well-being requiring continuous regulation. It also contributes to preventing risky behaviors, reducing sedentary lifestyles, and promoting social integration.

Enjoyment serves as a key source of motivation, ensuring sustained engagement in both practice and learning

Number of hours per course type: (2000 characters)

CM:

TD: 20

TP:

PR:

CONF:

Autres:

Evaluation (200 characters)**Assessment**

Students are evaluated on their participation, progress, and mastery of the competencies developed throughout the cycle.

Grading:

- 10 points for motor and cultural competencies.
- 5 + 5 points for two additional competencies selected by the instructor from personal, interpersonal and social, or methodological competencies.

Bibliography

Bibliography (2000 characters)

Cliquez ou appuyez ici pour entrer du texte.

Contacts

Contacts (2000 characters)

Cliquez ou appuyez ici pour entrer du texte.

Other information

Other information

Cliquez ou appuyez ici pour entrer du texte.

Nom de la matière : Spanish	Code EC: EC-HUMF06-ESP
Volume horaire total par étudiant: 21h	Nombre crédits ECTS : 1,5 ECTS
Responsable(s) : Marine Amargos Guilleray	

Généralités

Objectifs, finalités (2000 caractères)

1 – Beginner Level:

Establish the grammatical and linguistic foundations of the Spanish language. Introduce students to Spanish and Latin American cultures. Be able to produce simple sentences related to everyday topics.

2 – Intermediate Level:

Maintain and strengthen linguistic skills, and deepen cultural knowledge (Hispanic culture, Spanish and Latin American civilization, social issues).

- Know how to manage a team around a project.
- Be able to integrate into a multicultural environment.

Be capable of taking into account the social, environmental, technological, and economic

3 – Advanced Level:

Consolidation of linguistic skills and deepening of cultural knowledge (Hispanic culture, Spanish and Latin American civilization, social issues).

- Know how to manage a team around a project.
- Be able to integrate into a multicultural environment.
- Be capable of taking into account the social, environmental, technological, and economic challenges of Spanish-speaking countries.
- challenges of Spanish-speaking countries.

Description

Speaking and writing skills, listening and reading comprehension.

Pré-requis (2000 caractères)

Spanish A1: None

Spanish A2: Must have A1 level

Intermediate Spanish: Must have B1 level

Advanced Spanish: Must have B2 level

Modalités du cours et des évaluations

Langue d'enseignement (2000 caractères)

Spanish

Modalités d'enseignement (500 caractères)

Face-to-face tutorials

Volume horaire par type de cours : (2000 caractères)

CM :

TD : 21 hours /semester

TP :

PR :

CONF :

Autres :

Modalités d'évaluation / coefficient (200 caractères)

Continuous assessment- Coefficient 1,5

Bibliographie

Bibliographie (2000 caractères)

"La grammaire active de l'espagnol", le livre de poche. Collection Les langues modernes + "El arte de conjugar en español" -Hatier+ "Passez-moi l'expression en espagnol", Belin + "El español en la prensa", Belin

Contacts

Contacts (2000 caractères)

Marine Amargos Guilleray : marine.amargos@insa-rennes.fr

Autres

Autres informations

Cliquez ou appuyez ici pour entrer du texte.

Subject name: French foreign language	Code EC: EC-HUMF06-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-HUMF06-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-HUMF06-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

Nom de la matière : Language Project	Code EC: EC-HUMF06-LV2P
Volume horaire total par étudiant: 7 hours /semestre	Tous semestres
	Nombre crédits ECTS : 0,5
Responsable(s) : C.Hölnzer, M.Amargos, D.Fouré	

Généralités

Objectifs, finalités (2000 caractères)

German Project: 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 Using and improving German language skills within the framework of a project.

Spanish Project: 1- Prepare for the Spanish language certification: the DELE Spanish Project

2- Facilitate oral expression and build students' confidence before studying abroad in a Spanish-speaking country - Acquire fluency and enjoy expressing oneself in Spanish without being constrained by grammar rules.

French as a Foreign Language (FLE) Project: 'International Student Short Film Festival' in conjunction with the Interculturality course. An educational outing (or field study) is proposed to study an issue in social sciences and/or TSE that interests them. The aim is to produce an audiovisual report that may consist of interviews, particularly with experts and professionals, to address the issue on the programme. These meetings will enable them to exchange views and refine their analysis. Finally, students will be asked to present their findings to the public. The reports will be screened at an International Festival on an intercultural theme studied in class.

Description (2000 caractères)

German Project:

- Preparation for the Goethe Institute's 'Zertifikat' exam, level B2 or C1 (external certification)
- Thematic courses: cultural awareness
- Project related to the industrial world: international economics: Germany
- Preparation for mobility
- Preparation: study trip

Spanish Project:

Spanish Project 1

- Written and oral tests
- Written and oral work in preparation for the exam

Spanish Project 2

- Oral expression: debates on current affairs and discussions on the main concerns of students

FLE Project:

- Oral expression, confidence in front of an audience
- Creation of an audiovisual report
- Preparation for oral expression to obtain the DELFB2/DALFC1

Pré-requis (2000 caractères)

German Project: German Level B2

Spanish Project: Baccalaureate Level

FLE Project: Levels B1 to C1

Modalités du cours et des évaluations

Langue d'enseignement (2000 caractères)

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Modalités d'enseignement (500 caractères)

German Project: 7 hours/semester in class 10 hours of independent and group work Class hours are intended to review students' independent work and project progress. Most of the work is done outside of class, preferably in groups of 2 or 3 students (exception: 'Zertifikat' project with methodological assistance during class).

Spanish Project: Regular training with DELE workbook

Volume horaire par type de cours : (2000 caractères)

German Project: 7 hours of tutorials per semester

Spanish Project: 7 hours of tutorials per semester

FLE Project: 7 hours of tutorials per semester

Modalités d'évaluation :

German Project: Semester 1: Final Mark - Semester 2: Final Mark

Spanish Project: Written

FLE Project: Oral/Public presentation as part of an international short film festival

Coefficient: 0.5 (1 for Erasmus exchange students)

Bibliographie**Bibliographie (2000 caractères)**

German Project: Zertifikat Project: Goethe-Institut exam papers (B2 and C1) in the INSA library

Spanish Project: Books related to the DELE

Contacts

Contacts (2000 caractères)

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Autres

Autres informations

Cliquez ou appuyez ici pour entrer du texte.

Subject name: Intercultural Modul	Code EC: EC-HUMF06-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

Subject name: Russian	Code EC: EC-HUMF06-RUS
Number of hours per student: 21h	ECTS Number: 1,5
Reference Teacher: Cécile HÖLZNER-JACQUES	

Generalities

Objectives (2000 characters)

Russian beginner : acquire A1 level
 Russian intermediary : acquire A2/B1 level

Description (2000 characters)

Acquisition of grammatical basis and commonplace vocabulary.
 Training of the 5 skills, oral and written comprehension, oral and written expression, interaction.
 The stress is put on written and oral communication, firstly in the frame of daily situations, then with a progressive introduction of other themes and opening on the professional communication.
 Training with varied media (written, audio, video)
 Individual exercises and works in groups, talks from the intermediate level on.
 Grammar program depending on the level.
 (Inter) cultural opening

Requirements (2000 characters)

Course requirements and assessments

Teaching Language (2000 characters)

Teaching methods (500 characters)

Number of hours per course type: (2000 characters)

CM:

TD: one hour -and-a-half courses per week in SUPELEc

TP:

PR:

CONF:

Autres:

Evaluation (200 characters)

Final grade (overseen by SUPELEC).

Bibliography

Bibliography (2000 characters)

To be seen with the teacher

Contacts

Contacts (2000 characters)

Other information

Other information