Ecole Nationale Supérieure de Chimie de Rennes

# Undergraduate two-year programme in chemistry

# (CPI & Chem.I.St)

# ECOLE NATIONALE SUPERIEURE DE CHIMIE DE RENNES

# SYLLABUS

F Formation | RV Recherche & Valorisation | I International | Ri Relations industrielles | Rc Ressources communes | E+ Élèves ingénieurs

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# *CPI and CHEM.I.ST programmes*

**The Integrated classes préparatoires (CPI) and the International CHEM.I.ST programme (CHEMistry International STudy)** are for students who have obtained their scientific baccalaureate, and who are motivated by the jobs in chemistry and want to obtain **an engineering diploma in Chemistry or Chemical Engineering**

These classes, which have existed for more than **20 years in the city of Rennes**, present a **study programme which is more oriented towards chemistry**. The courses (in each of the two years of the CPI) run from September to June. The weekly workload is about 30 hours which is divided into **2/3 of scientific courses and 1/3 of non-scientific courses.**

**These classes (CPI & CHEM.I.ST) of the Federation Gay-Lussac (FGL) offer:**

- An engineering diploma in 5 years : 2 years in Rennes and 3 years in one of the 20 Schools of the FGL, entered without a competitive exam, only on **continuous assessment**,
- An excellent preparation for entry to the chemistry and chemical engineering schools
- An opening to the world by the practice of two foreign languages and also non-scientific disciplines
- A multicultural education through international classes.

**One year** corresponds to **60 ECTS-credits**: a complete 2-year programme usually provides 120 ECTS-credits.



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### Physics



### Mathematics and Computer science



## HUMANITIES



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## SECOND YEAR

# SCIENTIFIC COURSES

## Chemistry



## Physics



## Mathematics and Computer science



# HUMANITIES






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# FIRST YEAR
# CPI-1 & CHEM.I.ST-1

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**_Module_: CHEMISTRY**

**_Course_: Aqueous solutions**

***Course code*: CC1SAQ1C/ CI1SAQ1C**

***Course coordinator(s):*** Guirec LE BOZEC /Paul LEDUCQ

***Assessment details:*** Written assessment

| Year | Semester | Coefficient | Number of hours | |
|---|---|---|---|---|
| | | | Lecture | Tutorial |
| 1st | 1st | 2 | 30 h 40 | 16 h |

| | |
|---|---|
| ***Objectives*** | Knowing complexation and precipitation phenomena as well as acid-base phenomena in aqueous solution.<br>Learning how to foresee an aqueous solution composition<br>Mastering the method of dominating reactions |
| | |
| ***Programme*** | Acid-base equilibria (acidity and basicity constants)<br>Complexation and solubility constants<br>Influence of complexation and precipitation on solutions pH<br>Redox reactions, use in electrochemical energy conversion, Pourbaix diagram. |
| | |
| ***Supporting literature*** | ENSCR duplicated lecture and instruction notes. |



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**_Module_: CHEMISTRY**

**_Course_: Basics of quantum chemistry**

***Course code*: CC1ATO1C / CI1ATO1C**

***Course coordinator(s):*** Karine COSTUAS

***Assessment details:*** Written assessment

| Year | Semester | Coefficient | Number of hours | |
|---|---|---|---|---|
| | | | Lecture | Tutorial |
| 1st | 2nd | 1,50 | 12 h | 5 h 20 |

| | |
|---|---|
| ***Objectives*** | Introduction to quantum chemistry. Electronic structure of atoms |
| | |
| ***Programme*** | The need for a new theory in physics: Introduction to quantum mechanics (Black body, photoelectric effect, diffraction of photons and electrons…). Schrödinger equation of hydrogenoids. Electronic structure of atoms. |
| | |
| ***Supporting literature*** | "Elements of physical chemistry" by P. Atkins, J. de Paula; ed; W. H. Freeman & Co. |



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**_Module_: CHEMISTRY**

**_Course_: Chemical kinetics**

***Course code*: CC1CIN1C / CI1CIN1C**

***Course coordinator(s):*** Annabelle COUVERT

***Assessment details:*** Written assessment

| Year | Semester | Coefficient | Number of hours | |
|---|---|---|---|---|
| | | | Lecture | Tutorial |
| 1st | 2nd | 1,50 | 12 h | 6 h 40 |

| | |
|---|---|
| ***Objectives*** | To acquire knowledge on reaction kinetics, for homogeneous reactions, and particularly to learn how to determine kinetic law constants and orders, or activation energy of a reaction. |
| | |
| ***Programme*** | Rate laws. Formal kinetics. Experimental studies of kinetics.<br><br>Upstream knowledge: homogeneous kinetics (level Bac+2), chemistry, mathematics (derivation, integration, differential equations). |
| | |
| ***Supporting literature*** | Introduction à la Cinétique Chimique – S. LOGAN - Dunod<br><br>Cinétique Chimique – C. MOREAU, J-P. PAYEN - Belin<br><br>Chimie générale pour ingénieur – C.K.W. FRIEDLI - Presses polytechniques et universitaires romandes<br><br>Chimie générale – R. DIDIER - Tec & Doc<br><br>Chimie générale – Structure de la matière (Exercices) – P. MORLAES, J-C. MORLAES – Vuibert |



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**_Module_: CHEMISTRY**

**_Course_: Organic chemistry**

***Course code*: CC1ORGAG / CI1ORGAC**

***Course coordinator(s):*** Vincent FERRIERES

***Assessment details:*** Written assessment

| Year | Semester | Coefficient | Number of hours | |
|---|---|---|---|---|
| | | | Lecture | Tutorial |
| 1st | 2nd | 1,50 | 12 h | 8 h |

| | |
|---|---|
| ***Objectives*** | Lay the basis of organic chemistry:<br>What is a covalent bond?<br>Introduction to chemical reactivity. |
| | |
| ***Programme*** | From atoms to molecules: chemical bonding, physical chemistry.<br>Properties and reactivity of alkanes.<br>Properties and reactivity of alkenes. |
| | |
| ***Supporting literature*** | Chimie Organique - Cours<br>P. Arnaud, 16e Edition, Dunod Eds., 1996.<br>Chimie Organique - Les grands principes<br>J. McMurry, Dunod Eds., 2000.<br>Introduction à la chimie organique<br>Hart / Conia, InterEdition, 1997.<br>Chimie Organique Avancée<br>F. A. Carey, R. J. Sundberg, 3e Edition, DeBoeck Université, 1997. |



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## ***Module*: CHEMISTRY**

## ***Course*: Stereochemistry**

***Course code*:** CC1STERC / CI1STERC

***Course coordinator(s):*** Audrey DENICOURT

***Assessment details:*** Written assessment

| Year | Semester | Coefficient | Number of hours | |
|---|---|---|---|---|
| | | | Lecture | Tutorial |
| 1st | 1st | 1,50 | 9 h 20 | 9 h 20 |

| | |
|---|---|
| ***Objectives*** | To understand the basic knowledge of stereochemistry<br>To identify stereogenic centers in organic molecules,<br>To determine the absolute configuration (e.g. R or S)<br>To classify types of stereoisomers (e.g. enantiomers, diastereoisomers, meso compounds) |
| | |
| ***Programme*** | Space-filling models. Isomers. Conformational analysis. Configurational stereoisomery: Chirality, Absolute configuration (R or S), stereoisomer types (enantiomers, diastereoisomers, meso compounds), optical activity. |
| | |
| ***Supporting literature*** | Stereochemistry. D. G. Morris, Cambridge : Royal society of chemistry, 2001<br>Molécules chirales : stéréochimie et propriétés. A. Collet, J. Crassous, J.P. Dutasta, L. Guy, EDP sciences (Les Ulis,Essonne), 2006.<br>Stéréochimie des composés organiques. E. L. Eliel, S. H. Wilen, Technique & Documentation (Paris), 1996 |



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**_Module_: CHEMISTRY**

**_Course_: Thermochemistry**

***Course code*: CC1THECC / CI1THECC**

***Course coordinator(s):*** Guirec LE BOZEC

***Assessment details:*** Written assessment

| Year | Semester | Coefficient | Number of hours | |
|---|---|---|---|---|
| | | | Lecture | Tutorial |
| 1st | 1st and 2nd | 5 | 44 h | 24 h |

| | |
|---|---|
| ***Objectives*** | Knowing the role and interest of two thermodynamics principles applied to chemical transformations<br>Applying the thermodynamics main functions to chemical systems<br>Knowing the thermodynamic origin of equilibrium constants<br>Knowing the theoretical origin of the Nerst equation<br>Being able to predict general redox phenomena |
| | |
| ***Programme*** | Application of the first principle to chemistry (Kirchhoff law, flame temperature, reaction heat…)<br>Application of the second principle to chemistry. Systems equilibrium and evolution<br>Oxydoreduction theory and applications (Nernst equation, batteries and accumulators, corrosion phenomena…) |
| | |
| ***Supporting literature*** | ENSCR duplicated lecture and instruction notes. |



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**_Module_: CHEMISTRY**

**_Course_: Practical work in chemistry**

***Course code*: CC1TPCHP / CI1TPCHP**

***Course coordinator(s):*** Guirec LE BOZEC, Paul LEDUCQ

***Assessment details:*** Practical project work

| Year | Semester | Coefficient | Number of hours |
|---|---|---|---|
| | | | Practical work |
| 1st | 1st and 2nd | 5 | 56 h |

| | |
|---|---|
| ***Objectives*** | Mastering usual laboratory techniques (preparations, titrations, dilutions). Knowing analytical and synthetic methods in an aqueous milieu. Implementing a chemical kinetic study. Finalizing an experimental protocol. Knowing security rules and procedures in the laboratory. |
| | |
| ***Programme*** | Titration methods.<br>Experimental studies of acidobasic, precipitation, complexation and redox equilibria.<br>Follow-up of first and second order kinetics.<br>Experimental aspects of colorimetry, pH-metry, conductivity, potentiometry, spectrophotometry |
| | |
| ***Supporting literature*** | ENSCR duplicated lecture and instruction notes. |



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## ***Module*: PHYSICS**

## ***Course*: Electromagnetism**

***Course code*:** CI1PHY2M- CC1PHY5M

***Course coordinator(s):*** Julien GEANDROT / Jimmy ROUSSEL

***Assessment details:*** Written assessment

| Year | Semester | Coefficient | Number of hours | |
|---|---|---|---|---|
| | | | Lecture | Tutorial |
| 1st | 2nd | 3 | 22 h 40 | 22 h 40 |

| | |
|---|---|
| ***Objectives*** | Understanding the basics of electric and magnetic fields.<br>Determining the effects of electromagnetic induction on circuits.<br>Predicting the behaviour of electrical circuits. |
| | |
| ***Programme*** | Electric charge and Coulomb's law. Electrostatic field and potential. Electrostatic field flux. Electrostatic potential energy. Electrostatic conductors. Magnetic field created by current. Lorentz and Laplace forces. Particle in motion in an electromagnetic field. Induction. Circuit elements. Electrical circuit. Transitional regime. Sine regime. |
| | |
| ***Supporting literature*** | Tout-en-un Physique PCSI, Marie-Noëlle Sanz, Anne-Emmanuelle Badel, François Clausset - Editions Dunod 2008<br>"Précis Électromagnétisme PCSI" – P.Krempf – Bréal<br>http://physique.ensc-rennes.fr/ |



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**_Module_: PHYSICS**

**_Course_: Mechanics**

***Course code*: CI1PHY2M- CC1PHY5M**

***Course coordinator(s):*** Julien GEANDROT / Jimmy ROUSSEL

***Assessment details:*** Written assessment

| Year | Semester | Coefficient | Number of hours | |
|---|---|---|---|---|
| | | | Lecture | Tutorial |
| 1st | 1st | 3 | 22 h 40 | 22 h 40 |

| | |
|---|---|
| ***Objectives*** | Study two-dimensional problems<br>Study of practical problems in classical mechanics<br>Being able to understand the modeling of real situations<br>Using different coordinate systems : Cartesian or polar |
| | |
| ***Programme*** | Dimensions and units. Vector tools. Kinematics. Fundamental principle of the dynamics. Energetics. Mechanical oscillators. Simple motion of a rigid body. Torque, kinetic moment theorem. Central forces. Non-inertial reference frames. Shocks. |
| | |
| ***Supporting literature*** | Tout-en-un Physique PCSI, Marie-Noëlle Sanz, Anne-Emmanuelle Badel, François Clausset - Editions Dunod 2008<br>"Précis Mécanique PCSI" - C.Clerc - P.Clerc – Bréal<br>http://www.physagreg.fr/<br>http://www.femto-physique.fr/optique_geometrique/ |



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**_Module_: PHYSICS**

**_Course_: Modeling and geometrical optics**

***Course code*: CI1PHY2M- CC1PHY5M**

***Course coordinator(s):*** Julien GEANDROT / Jimmy ROUSSEL

***Assessment details:*** Written assessment

| Year | Semester | Coefficient | Number of hours | |
|---|---|---|---|---|
| | | | Lecture | Tutorial |
| 1st | 1st | 2 | 13 h 20 | 13 h 20 |

| | |
|---|---|
| ***Objectives*** | First of all, we introduce tools and methods of the scientific approach especially for practical activities. Then we bring back to mind basic knowledge of geometrical optics to deal with theoretical and experimental physics in higher education. |
| | |
| ***Programme*** | Scientific approach. Uncertainties. Model and domain of validity. Verification of a law. Geometrical optics. Descartes' laws. Fermat's principle. Thin lenses. Application : some optical instruments. |
| | |
| ***Supporting literature*** | Optique. J-P Faroux, J. Renault. Paris, Ed. Dunod<br><br>Optique géométrique et optique physique. J-P~Parisot, P.~Segonds, S~Le Boiteux. Paris, Ed. Dunod.<br><br>Web :<br>http://www.physagreg.fr/<br>http://www.femto-physique.fr/optique_geometrique/ |



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## ***Module*: PHYSICS**

## ***Course*: Thermodynamics**

***Course code*:** CC1THEPC / CI1THEPC

***Course coordinator(s):*** Paul LEDUCQ

***Assessment details:*** Written assessment

| Year | Semester | Coefficient | Number of hours | |
|---|---|---|---|---|
| | | | Lecture | Tutorial |
| 1st | 2nd | 2 | 13 h 20 | 13 h 20 |

| | |
|---|---|
| ***Objectives*** | Knowing how to study the energy exchange processes between systems (work and heat transfer)<br>Knowing the main thermodynamic functions (internal energy, enthalpy, entropy …)<br>Knowing the two thermodynamics principles and applying them to the thermo-elastic transformations of gas and condensed phases |
| | |
| ***Programme*** | First principle of thermodynamics.<br>Second principle of thermodynamics.<br>Thermodynamic study of real and perfect gases.<br>Thermodynamic cycles<br>Thermal transfer and phase transitions<br>Spontaneous evolution of physical systems |
| | |
| ***Supporting literature*** | ENSCR duplicated lecture and instruction notes. |



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## ***Module*: PHYSICS**

## ***Course*: Practical work**

***Course code*:** CC1ELMAC / CI1ELMAC

***Course coordinator(s):*** Julien GEANDROT / Jimmy ROUSSEL / Jelena JEFTIC

***Assessment details:*** Practical project work

| Year | Semester | Coefficient | Number of hours |
|---|---|---|---|
| | | | Practical work |
| 1st | 1st and 2nd | 4 | 40 h 20 |

| | |
|---|---|
| ***Objectives*** | Use Uncertainties.<br>Use measure in order to verify a physic law. |
| | |
| ***Programme*** | Thermodynamics : pressure and temperature law, calorimetry<br>Optics : convergent and divergent lenses, telescope, eye<br>Electromagnetism : earth magnetic field, electric field<br>Electricity : oscilloscope and GBF manipulation, filters, current sources, linear component<br>Mechanics : moment of force, Centrifugal force, oscillators |
| | |
| ***Supporting literature*** | https://physique.ensc-rennes.fr |



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**_Module_: MATHEMATICS**

**_Course_**: Matrices, linear algebra, calculus

***Course code*:** CC1ALG1C / CI1ALG1C

***Course coordinator(s):*** Pierre-Vincent QUERE / Philippe MORVAN

***Assessment details:*** Written assessment

| Year | Semester | Coefficient | Number of hours | |
|---|---|---|---|---|
| | | | Lecture | Tutorial |
| 1st | 2nd | 5,25 | 40 h | 40 h |

| | |
|---|---|
| ***Objectives*** | Introduce matrix calculus and linear algebra. Practice analysis with new efficient tools. |
| | |
| ***Programme*** | Linear Systems. Matrices. Determinants. Linear Algebra: linear spaces and mappings in n dimension.<br>Integral calculus. Taylor's formulas & Taylor Series. |
| | |
| ***Supporting literature*** | Marie Allano-Chevalier, Xavier Oudot : "Maths - PCSI-PTSI - 1ère année" - Collection H-Prépa [Hachette]<br>"Mathématiques : Cours de première année" : http://exo7.emath.fr/cours/cours-exo7.pdf |



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**_Module_**: MATHEMATICS

**_Course_**: Calculus, logic, basic calculus

***Course code*:** CC1ANA1C / CI1ANA1C

***Course coordinator(s):*** Philippe MORVAN / Pierre-Vincent QUERE

***Assessment details:*** Written assessment

| Year | Semester | Coefficient | Number of hours | |
|---|---|---|---|---|
| | | | Lecture | Tutorial |
| 1st | 1st | 5,25 | 40 h | 40 h |

| | |
|---|---|
| ***Objectives*** | Review the achievements of secondary school. Extend and improve calculus skills for Physics and Chemistry teachings. Introduce logic and algebra new formalism. |
| | |
| ***Programme*** | Mathematical methods for physics and chemistry: equations and inequations, geometry and trigonometry, differential equations of first & second order, elementary functions.<br>Complex numbers. Logic. Natural numbers and polynomials.<br>Real numbers. Sequences. Differential calculus (one variable). |
| | |
| ***Supporting literature*** | Marie Allano-Chevalier, Xavier Oudot : "Maths - PCSI-PTSI - 1ère année" - Collection H-Prépa [Hachette]<br><br>"Mathématiques : Cours de première année" : http://exo7.emath.fr/cours/cours-exo7.pdf |



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**_Module_: COMPUTER SCIENCE**

**_Course_: Computer-assisted mathematics and programming**

***Course code*: CC1MAO2P / CI1MAO2P**

***Course coordinator(s):*** Pierre-Vincent QUERE

***Assessment details:*** Practical project work / written assessment

| Year | Semester | Coefficient | Number of hours | |
|---|---|---|---|---|
| | | | Practical work | Tutorial |
| 1st | 1st and 2nd | 2,50 | 16 h | 4 h |

| | |
|---|---|
| ***Objectives*** | Use of the software Sage to solve mathematical problems along the year. |
| | |
| ***Programme*** | Introduction to basic concepts of programming language: types, variables, iteration structures, conditional statements. Basic procedures.… |
| | |
| ***Supporting literature*** | Calculs mathématiques avec Sage (Casamayou & al., 2013). |



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***Module*: HUMANITIES**

***Course*: Communication (CPI)**

***Course code*:** CC1EXPRC

***Course coordinator(s):*** Stéphanie GUILLOUX

***Assessment details:*** Written assessment / project report

| Year | Semester | Coefficient | Number of hours |
|---|---|---|---|
| | | | Lecture |
| 1st | 1st | 1,5 | 21 h 20 |

| | |
|---|---|
| ***Objectives*** | To build a professional project.<br>To be able to write and adapt a cv<br>To be able to analyze job expectation<br>To experiment professional interview |
| | |
| ***Programme*** | Analyzing personal path and traducing it as competencies<br>Building professional expectation<br>Analyzing organization<br>Writing a resume and cover letter.<br>Experimenting interview |
| | |
| ***Supporting literature*** | Available on request. |



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**_Module_: HUMANITIES**

**_Course_: Economics (CPI)**

***Course code*: CC1ECONC**

***Course coordinator(s):*** Frédérique PERGOLA

***Assessment details:*** Written assessment

| Year | Semester | Coefficient | Number of hours |
|---|---|---|---|
| | | | Lecture |
| 1st | 2nd | 1,5 | 21 h 20 |

| | |
|---|---|
| ***Objectives*** | To acquire basic economic concepts. |
| | |
| ***Programme*** | The firm in its environment : goods and services, factors of production, costs, revenue and profit.<br>The economic growth : added value, GDP and business cycle<br>Macroeconomics : Monetary and fiscal policy |
| | |
| ***Supporting literature*** | Available on request. |



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**_Module_: HUMANITIES**

**_Course_:** Geopolitics and international openness

(Chem.I.st)

***Course code*:** CI1OUINC

***Course coordinator(s):*** Marianne BLACHE

***Assessment details:*** Written assessment /project report

| Year | Semester | Coefficient | Number of hours |
|---|---|---|---|
| | | | Lecture |
| 1st | 1st and 2nd | 3 | 42 h 40 |

| | |
|---|---|
| ***Objectives*** | Students must understand the principe of geopolitics questions and their importance in internationals relations.<br><br>The lessons present general approach and different questions to illustrate this theme. |
| | |
| ***Programme*** | Definition and global view of international challenges.<br><br>1/-Introduction of the Geopolitics<br>2/-Occident and the global menaces (economic tensions, …)<br>3/-Geopolitics of the United States<br>4/-The question of Middle East<br>5/-Geopolitics of Israel<br>6/-Space and international Relations<br>7/-Water's Geopolitics : economic and social questions, and subject of conflict between states<br>8/-Africa : Characteristic of the continent and geopolitics tensions |
| | |
| ***Supporting literature*** | Available on request. |



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**_Module_: HUMANITIES**

**_Course_: English**

***Course code*: CC1ANGLD / CI1ANGLD**

***Course coordinator(s):*** Pierre BRIEND / Marcel VIDELO

***Assessment details:*** Written and oral assessment

| Year | Semester | Coefficient | Number of hours |
|---|---|---|---|
| | | | Tutorial |
| 1st | 1st and 2nd | 5 | 56 h |

| | |
|---|---|
| ***Objectives*** | Improvement of the students' linguistic acquisition and communication competence<br><br>Cultural and civilizational enrichment |
| | |
| ***Programme*** | Society issues<br>International (geo)politics<br>General science and technology questions<br>Oral presentations |
| | |
| ***Supporting literature*** | Resources of the internet (press articles, radio and TV programmes). |



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***Module*: HUMANITIES**

***Course*: French as a foreign language (international students only)**

***Course code*:** CI1EFLED

***Course coordinator(s):*** Virginie VIGNERON / Anne BERNIER/ Pierre BRIEND

***Assessment details:*** Written and oral assessment

| Year | Semester | Coefficient | Number of hours |
|---|---|---|---|
| | | | Tutorial |
| 1st | 1st and 2nd | 5 | 86 h 40 |

| | |
|---|---|
| ***Objectives*** | Acquire and master linguistic tools to communicate easily and efficiently in familiar situations (study, home, work, leisure activities)<br><br>Develop skill in oral and written expression and comprehension.<br><br>Learn more about French culture and society |
| | |
| ***Programme*** | Comprehension activities with authentic materials.<br>Training of oral (presentations, discussions, debates …) and written expression<br><br>Grammar, vocabulary and pronunciation exercises |
| ***Supporting literature*** | Available on request.<br>Book used in the classroom: Totem 3, Hachette |



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**_Module_: HUMANITIES**

**_Course_: German**

***Course code*: CC1ALMDD / CI1ALMDD**

***Course coordinator(s):*** Gisela HAUER

***Assessment details:*** Written and oral assessment

| Year | Semester | Coefficient | Number of hours |
|---|---|---|---|
| | | | Tutorial |
| 1st | 1st and 2nd | 5 | 56 h |

| | |
|---|---|
| ***Objectives*** | To give the linguistic tools<br><br>To develop abilities in verbal and written expression and communication.<br><br>To develop autonomy in the language. |
| | |
| ***Programme*** | -the main topics are based on media language occuring prominently in everyday life.<br>-other themes approached in the first and second academic years are chosen in the light of their topicality and in the light of current interests, students' suggestions or work on a recent film. |
| | |
| ***Supporting literature*** | German teaching uses authentic documents and documents adapted for students:<br><br>http://www.dw.de/deutsch-lernen/top-thema/s-8031<br>http://www.goethe.de/ |



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**_Module_: HUMANITIES**

**_Course_: Spanish**

***Course code*: CC1ESPAD/ CI1ESPAD**

***Course coordinator(s):*** Antonieta ORE / Luis Miguel GONZALEZ

***Assessment details:*** Written and oral assessment

| Year | Semester | Coefficient | Number of hours |
|---|---|---|---|
| | | | Tutorial |
| 1st | 1st and 2nd | 5 | 56 h |

| | |
|---|---|
| ***Objectives*** | To give linguistic tools<br><br>To develop abilities in verbal and written expression and communication.<br><br>To increase autonomy in the language. |
| | |
| ***Programme*** | -the main topics are based on media language occuring prominently in everyday life.<br><br>-other themes approached in the first and second academic years are chosen in the light of their topicality and in the light of current interests, students' suggestions or work on a recent film. |
| | |
| ***Supporting literature*** | The main Hispanic newspapers (El Pais, El Mundo, La Vanguardia, El Clarín, El Comercio, El Mercurio etc.) as well as the Spanish version of the BBC. The television channels RTVE, Antena 3. For Spanish grammar our reference is 'Real Academia Española'. |



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**_Module_: METHODOLOGIE**

**_Course_: Learning how to learn**

***Code*: CC1METHD**

***Course coordinator(s):*** Amélie JOSSE / Annick TARTIERE

***Assessment details*** : no exam

| Year | Semester | Number of hours |
|---|---|---|
| | | Lecture |
| 1ère | 1er | 5 h 20 |

| | |
|---|---|
| ***Objectives*** | Motivation and academic performance<br>Short term memory<br>Long term memory and work organization<br>Stress management |
| | |
| ***Programme*** | Origins of motivation<br>Motivation techniques in studies<br>Understanding the function of short term memory in order to improve your note-taking.<br>Understand interactions between attention and working memory<br>Understanding the function of long term memory to store information.<br>Organizing knowledge to be able to use efficiently<br>Work planning tools<br>Understanding and preventing stress<br>Boost your self-confidence<br>Stimulate your concentration skills<br>Exam preparations |
| | |
| ***Supporting literature*** | lain Lieury « motivation et réussite scolaire », 3ème édition Broché – 5 juin 2013<br>« Votre mémoire : Bien la connaître, mieux s'en servir » Broché – 30 juin 2004<br>Le cerveau attentif, J.P. Lachaux, édition Odile Jacob |



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# SECOND YEAR
# CPI-2 & CHEM.I.ST-2

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**_Module_: CHEMISTRY**

**_Course_: Chemical bonding**

***Course code*: CC2ATLCC / CI2ATLCC**

***Course coordinator(s):*** Mikael KEPENEKIAN

***Assessment details:*** Written assessment

| Year | Semester | Coefficient | Number of hours | |
|---|---|---|---|---|
| | | | Lecture | Tutorial |
| 2nd | 1st | 2 | 16 h | 6 h 40 |

| | |
|---|---|
| ***Objectives*** | Chemical bonding in molecules. |
| | |
| ***Programme*** | Covalent bonds: VSPER and hybrid atomic orbital models to determine the geometries of molecules. The quantum nature of the covalent bonding: Electronic structure of small molecules. Ionic bonds. |
| | |
| ***Supporting literature*** | "An introduction to molecular orbitals" Y. Jean, F. Volatron, J. K. Burdett, OUP USA. |



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## ***Module*: CHEMISTRY**

## ***Course*: Crystallography**

***Course code*:** CC2INORC/ CI2INORC

***Course coordinator(s):*** Jelena JEFTIC

***Assessment details:*** Written assessment

| Year | Semester | Coefficient | Number of hours | |
|---|---|---|---|---|
| | | | Lecture | Tutorial |
| 2nd | 1st | 2 | 16 h | 8 h |

| | |
|---|---|
| ***Objectives*** | Gain the basic knowledge in Cristallography in order to be able to attend the courses in Crystallochemistry and Inorganic Chemistry in the engineering cycle of Chemistry studies. |
| | |
| ***Programme*** | The crystalline solid. Crystalline state. Basic concepts of crystallography (network, knot, primitive cell, crystal system, Bravais lattice). Symmetry (symmetry operations, point group). Metallic crystals. Metallic characteristics, metallic bonding, stereochemistry of metallic crystals (packing efficiency in hcp and ccp structures). Ionic crystals. Stereochemistry of ionic crystals ***CsCl, NaCi,*** sphalerite, fluorite). Covalent crystals. Molecular crystals : ice. The true crystal. |
| | |
| ***Supporting literature*** | M. Van Meersche, J. Feneau-Dupont “Introduction à la Cristallographie et à la Chimie Structurale” Edition Peeters, 1984, Paris.<br><br>Alain Pénicaud « Les cristaux, fenêtres sur l’invisible », Edition Ellipses, 1999, Paris. |



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**_Module_: CHEMISTRY**

**_Course_: Environmental chemistry**

***Course code*: CC2CHENC/ CI2CHENC**

***Course coordinator(s):*** Pierre LE CLOIREC

***Assessment details:*** Written assessment

| Year | Semester | Coefficient | Number of hours |
|---|---|---|---|
| | | | Lecture |
| 2nd | 2nd | 1 | 9 h |

| | |
|---|---|
| ***Objectives*** | Basic concepts in environment and water treatments. |
| | |
| ***Programme*** | The hydrologic cycle. The carbon cycle, nitrogen cycle, the phosphorus cycle, the sulfur cycle. Interaction of various cycles.<br><br>Water treatments – Principle and design of some drinking water treatment processes. |
| | |
| ***Supporting literature*** | F. Ramade (2007), Introduction à l'écotoxicologie, Tec & Doc, Lavoisier, Paris<br><br>P.H. Raven, L.R. Berg, D.M. Hassenzahl (2009), Environment, De Boeck, Bruxelles<br><br>L. Siggs, Ph. Behra, W. Stumm (2006), Chimie des milieux aquatiques, Dunod, Paris, 4ème Edition<br><br>J.M. Montgomery (1985), Water treatment Principles and Design, John Wiley & Sons, New York, NY, USA<br><br>S.R. Qasim, E.M. Motley, G. Zhu (2000), Water works engineering, Prentice Hall, Upper Saddle River, NJ, USA. |



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## ***Module*: CHEMISTRY**

## ***Course*: Infrared and ultraviolet-visible spectroscopies**

***Course code*:** CC2SPECC/ CI2SPECC

***Course coordinator(s):*** Didier HAUCHARD

***Assessment details:*** Written assessment

| Year | Semester | Coefficient | Number of hours | |
|---|---|---|---|---|
| | | | Lecture | Tutorial |
| 2nd | 2nd | 1,5 | 10 h 40 | 6 h 40 |

| | |
|---|---|
| ***Objectives*** | Acquisition of knowledge in atomic and molecular spectroscopies. To become familiar with different spectroscopic techniques and their application perimeter. To understand particularly principles, applications and spectra interpretation in Infrared and UV/Visible spectroscopies. |
| | |
| ***Programme*** | Introduction of general concepts of spectroscopic methods and techniques. Electromagnetic radiation and Interaction of radiation with matter. Description of different types of atomic (AAS, EAS, ICP, fluorescenceX) and molecular (UV/visible, Fluorescence, IR) spectroscopies based on absorption or emission of electromagnetic radiations (principles, applications, equipment, examples).<br>Spectroscopic methods in detailed :<br>Ultraviolet-visible spectroscopy.<br>Chromophores and electronic transition, solvent and pH effects, conjugation and empiric rules for organic compounds, quantitative analysis, chemical constant determination, apparatus<br>Infrared spectroscopy.<br>Theory of IR absorption and molecular vibration modes. IR spectra in relation with molecular structure. Identification and interpretation of IR absorption bands. Applications (apparatus, cells, samples) |
| | |
| ***Supporting literature*** | M. Hessen H. Meier, B. Zeeh “Méthodes spectroscopiques pour la chimie organic”, Masson, Paris, 1995.<br>J.L. Burgot et G. Burgot “Méthodes instrumentales d'analyse chimique et applications”, Tec&doc, Lavoisier, 3ème edition, 2011. |



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**_Module_: CHEMISTRY**

**_Course_: Inorganic materials**

***Course code*: CC2INORD/ CI2INORD**

***Course coordinator(s):*** Eric LE FUR

***Assessment details:*** Written assessment

| Year | Semester | Coefficient | Number of hours | |
|---|---|---|---|---|
| | | | Lecture | Tutorial |
| 2nd | 2nd | 1,5 | 9 h 20 | 5 h 20 |

| | |
|---|---|
| ***Objectives*** | Knowing the different classes of materials (metals and alloys, ceramics, polymers).<br>Having knowledge's in structural aspects of alloys and ceramic materials.<br>Knowing some uses of materials detailing structure-properties relationships. |
| | |
| ***Programme*** | Crystal structure of metals (body centered cubic, hexagonal close paked, face centerd cubic) and ceramics (rock salt, caesium chloride, zinc blende, …)<br><br>Structural approach of metals and alloys (polymorphism, solid solution, alloys)<br><br>Structure-properties relationships in ceramics (lithium batteries materials, anionic conducting ceramics…).<br><br>Crystal defects |
| | |
| ***Supporting literature*** | Chimie physique, Paul Arnaud 6ième édition, DUNOD |



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## ***Module*:** CHEMISTRY

## ***Course*:** Nuclear magnetic resonance (NMR)

***Course code*:** CC2SPECD/ CI2SPECD

***Course coordinator(s):*** Thierry BENVEGNU

***Assessment details:*** Written assessment

| Year | Semester | Coefficient | Number of hours | |
|---|---|---|---|---|
| | | | Lecture | Tutorial |
| 2nd | 1st | 1 | 6 h 40 | 8 h |

| | |
|---|---|
| ***Objectives*** | This course is designed to introduce the techniques of both $^{1}H$ and $^{13}C$ NMR spectroscopy as powerful tools for structure elucidation in organic chemistry. A brief introduction to the principles of NMR spectroscopy will be followed by extensive analysis and discussion of NMR parameters such as chemical shift, coupling constants, splitting patterns, etc. NMR ($^{1}H$ and $^{13}C$) spectral interpretation to characterize and/or to elucidate the chemical structure of molecules will be studied in details. |
| | |
| ***Programme*** | The principle of NMR spectroscopy. Proton $^{1}H$ NMR: chemical shift, integration, chemical equivalence, spin coupling interaction, (n + 1) rule of multiplicity, chemical shift non equivalence, spectral interpretation). Carbon-13 NMR (resolution, multiplicity, spin decoupling, off-resonance decoupling, NOE, DEPT, structural applications, spectral interpretation). |
| | |
| ***Supporting literature*** | 1. Modern NMR Spectroscopy: a Guide for Chemists / Jeremy K.M. Sanders and Brian K. Hunter ISBN: 0198555660: 0198555679 (pbk.). 2. Spectroscopic Methods in Organic Chemistry / Dudley H. Williams, Ian Fleming. ISBN 0077091477 (pbk). 3. NMR Spectroscopy by Roger S. Macomber. 4. Nuclear Magnetic Resonance Spectroscopy: An Introduction to Principles, Applications and Experimental Methods by Lambert and Mazzola. ISBN 0-13-089066-9 (Prentice Hall). 5. Spectroscopic Identification of Organic Compounds by Silverstein, Webster, Kimble and Kimble. ISBN 0471393622. |



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## ***Module*: CHEMISTRY**

## ***Course*: Organic chemistry**

***Course code*:** CC2CHORC/ CI2CHORC

***Course coordinator(s):*** Christophe CREVISY / Alain ROUCOUX

***Assessment details:*** Written assessment

| Year | Semester | Coefficient | Number of hours | |
|---|---|---|---|---|
| | | | Lecture | Tutorial |
| 2nd | 1st and 2nd | 5 | 37 h 20 | 22 h 40 |

| | |
|---|---|
| ***Objectives*** | Overview on organic functional groups and their reactivity.<br><br>Understanding the reaction and the properties of various families of organic compounds.<br><br>Explaining the main mechanisms of organic chemistry reactions. |
| | |
| ***Programme:*** | Presentation of the properties and the reactivity of the major functions of organic molecules and description of the reaction mechanisms: Unsaturated hydrocarbons (alkenes, alkynes), aromatic chemistry (aromaticity, reactivity), halides (Nucleophilic Substitution & Elimination reactions), organometallic compounds (Li & Mg), oxygen containing molecules (alcohols and carbonyl derivatives), amines, carboxylic acids and derivatives. … |
| | |
| ***Supporting literature:*** | Traité de chimie organique, K. Peter C. Vollhardt, Neil Eric Schore (Ed) De Boeck Supérieur, 2004<br>http://chimiegenerale.org/Textes/Orga/TableMat.html |



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**_Module_: CHEMISTRY**

**_Course_: Practical work in mineral chemistry**

***Course code*: CC2TPGMP/ CI2TPGMP**

***Course coordinator(s):*** Eric LE FUR / Jean-Yves PIVAN / Nicolas BRANEYRE/ Thierry BATAILLE

***Assessment details:*** Practical project work

| Year | Semester | Coefficient | Number of hours |
|---|---|---|---|
| | | | Practical work |
| 2nd | 1st and 2nd | 2 | 24 h |

| | |
|---|---|
| ***Objectives*** | Practical applications of theoretical knowledge acquired during undergraduate program. |
| | |
| ***Programme*** | Chlorine/caustic soda process, gravimetric analysis, a kinetic study of competitive reactions, silver recovery from radiographic films, synthesis and characterization of cobalt complexes. |
| | |
| ***Supporting literature*** | Lab handout. |



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**_Module_: CHEMISTRY**

**_Course_: Practical work in organic chemistry**

***Course code*: CC2TPORP/ CI2I TPORP**

***Course coordinator(s):*** Audrey DENICOURT / Thierry BENVEGNU /Sylvain TRANCHIMAND

***Assessment details:*** Practical project work

| Year | Semester | Coefficient | Number of hours |
|---|---|---|---|
| | | | Practical work |
| 2nd | 1st and 2nd | 4 | 48 h |

| | |
|---|---|
| ***Objectives*** | To be able to overcome experimental techniques of organic synthesis.<br>To be able to implement the synthesis of an organic compound, to work-up the reaction mixture and to purify the resulting product.<br>To respect the safety rules. |
| | |
| ***Programme*** | Fractional distillation, Liquid-liquid extraction, Recrystallization, Thin Layer Chromatography (TLC)<br>Organic syntheses: esterification, Grignard synthesis, oxidation, aldolisation, chlorination, aromatic electrophilic substitution…..<br>Analytical techniques in organic chemistry (NMR, IR, TLC, GC …). |
| | |
| ***Supporting literature*** | Films available on the e-formation website (ENSCR). |



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**_Module_: PHYSICS**

**_Course_: Electromagnetism**

***Course code*: CC2ELMAC/ CI2ELMAC**

***Course coordinator(s):*** Olivier FRANTZ

***Assessment details:*** Written assessment

| Year | Semester | Coefficient | Number of hours | |
|---|---|---|---|---|
| | | | Lecture | Tutorial |
| 2nd | 1st | 3 | 21 h 20 | 21 h 20 |

| | |
|---|---|
| ***Objectives*** | Using Maxwell's equations to study the propagation of electromagnetic waves in various environments.<br>Establishing a model for describing dielectric or magnetic materials. |
| | |
| ***Programme*** | Maxwell's equations. Dielectric materials. Polarization origins. Magnet environments. Paramagnetism and diamagnetism. Ferromagnetism. Electromagnetic waves in vacuum. Planewaves. Metallic reflexion. Standing waves. Electromagnetic waves in dielectric medium. |
| | |
| ***Supporting literature*** | Physique des Ondes, électromagnétisme et optique, Stéphane Olivier, Tec&Doc<br>Électromagnétisme, fondements et applications, José Philippe Pérez, Dunod |



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**_Module_: PHYSICS**

**_Course_: Fluid mechanics – transport phenomena**

***Course code*: CC2MEFLC/ CI2MEFLC**

***Course coordinator(s):*** Olivier FRANTZ

***Assessment details:*** Written assessment

| Year | Semester | Coefficient | Number of hours | |
|---|---|---|---|---|
| | | | Lecture | Tutorial |
| 2nd | 2nd | 3 | 21 h 20 | 21 h 20 |

| | |
|---|---|
| ***Objectives*** | Introduce principles of fluid mechanics and transport phenomena.<br>Use dimensional analysis and orders of magnitude estimations of some usual macroscopic situations.<br>Learn how to perform mass, moment and energy balance. |
| ***Programme*** | Fluids at rest, static pressure, hydrostatic equation, buoyancy.<br>Surface tension, capillarity.<br>Dynamics of ideal fluids. Equation of continuity, Euler equation, Bernoulli equation.<br>Newtonian Fluids dynamics: Viscosity, Navier-Stokes equation, Reynolds number, Poiseuille's formula, Pressure loss, Moody friction flow factor, Stokes' Formula, lift and drag.<br>Fick's laws of diffusion, statistical approach.<br>Heat transfer, conduction, convection, radiation. Thermal resistance. Energy balance equation. |
| | |
| ***Supporting literature*** | L.Couture, Ch. Chahine and R. Zitoun. Thermodynamique. ed. Dunod. Paris, 1989.<br>Les techniques de l'ingénieur. Paris, France<br>http://www.femto-physique.fr/ |



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## ***Module*: PHYSICS**

## ***Course*: Modern physics**

***Course code*:** CC2PHSTC/ CI2PHSTC

***Course coordinator(s):*** Jimmy ROUSSEL/ Olivier FRANTZ/ Paul LEDUCQ

***Assessment details:*** Written assessment

| Year | Semester | Coefficient | Number of hours | |
|---|---|---|---|---|
| | | | Lecture | Tutorial |
| 2nd | 2nd | 2 | 16 h | 16 h |

| | |
|---|---|
| ***Objectives*** | Introduce phenomena and / or concepts of physics discovered in the twentieth century. |
| | |
| ***Programme*** | Black body radiation and application to sciences of the Universe.<br>Statistical thermodynamics and the Boltzmann law. The link between the macroscopic universe and the microscopic universe.<br>Principle of the laser and applications.<br>Doppler effect and applications<br>Introduction to physics of semiconductors. elements of electronics. |
| | |
| ***Supporting literature*** | H. Benson. Physique 3 : Ondes, Optique et Physique Moderne, Editor De Boeck, 2005, Bruxelles.<br>F. Bretanaker et N. Treps. Le laser, coll. Une introduction à, EDP sciences, 2010<br>S Houard. Optique - une approche expérimentale et pratique, DeBoeck.<br>D. angoisse et al. Les lasers, Dunod.<br>B. Diu et al. Eléments de physique statistique. Hermann 1989. |



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**_Module_: PHYSICS**

**_Course_: Waves**

***Course code*: CC2OPTIC/ CI2OPTIC**

***Course coordinator(s):*** Olivier FRANTZ

***Assessment details:*** Written assessment

| Year | Semester | Coefficient | Number of hours | |
|---|---|---|---|---|
| | | | Lecture | Tutorial |
| 2nd | 1st | 2 | 16 h | 16 h |

| | |
|---|---|
| ***Objectives*** | Mastering the wave properties of light.<br>Exploiting a diffraction pattern.<br>Understanding the vectorial nature of light to explain birefringence, polarizer or waveplates. |
| | |
| ***Programme*** | Physical optics. Interference. Diffraction. Networks. Vectorial waves. |
| | |
| ***Supporting literature*** | Optique, fondements et applications, José-Philippe Pérez. |



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## ***Module*: PHYSICS**

## ***Course*: Practical work in physics**

***Course code*:** CC2TPPHP/ CI2TPPHP

***Course coordinator(s):*** Jimmy ROUSSEL/ Olivier FRANTZ /Julien GEANDROT

***Assessment details:*** Practical project work

| Year | Semester | Coefficient | Number of hours |
|---|---|---|---|
| | | | Practical work |
| 2nd | 1st and 2nd | 3 | 30 h |

| | |
|---|---|
| ***Objectives*** | Practical activities to develop :<br><br>Modeling and analyzing phenomena; "scientific attitudes", such as skepticism, rationalism and objectivity; ability to communicate. |
| ***Programme*** | Determination of refractive index of a glass with a goniometer<br>Properties of grating.<br>Celerity of light measurement.<br>Fraunhoffer diffraction.<br>Celerity of Acoustic waves.<br>Some properties of Hertzian waves.<br>Study of polarization and measurement of optical rotation<br>Introduction to Fourier analysis<br>Measurement of viscosity<br>Capillarity<br>Fluid mechanics: Bernoulli relation and Venturi effect.<br>Determination of the specific charge of the electron.<br>Skin effect in a coil. |
| | |
| ***Supporting literature*** | Duffait, R. Expériences de physique CAPES de sciences physiques, 2008 Éditeur: Breal.<br>Quaranta, L. (1986). Dictionnaire de physique expérimentale.<br>http://physique.ensc-rennes.fr |



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**_Module_: MATHEMATICS**

**_Course_: Mathematics**

***Course code*: CC2ALG2C/ CI2ALG1L**

***Course coordinator(s):*** François DEBURGHRAEVE

***Assessment details:*** Written assessment

| Year | Semester | Coefficient | Number of hours | |
|---|---|---|---|---|
| | | | Lecture | Tutorial |
| 2nd | 1st | 5 | 40 h | 40 h |

| | |
|---|---|
| ***Objectives*** | Gain the basic knowledge in Mathematics in order to be able to attend the courses in the engineering cycle of Chemistry studies. |
| | |
| ***Programme*** | Linear algebra<br>Reduction<br>Integration<br>Series<br>Functions of several variables: differential calculus<br>Probabilities |
| | |
| ***Supporting literature*** | None. |



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**_Module_: COMPUTER SCIENCE**

**_Course_: Computer science and programming**

***Course code*: CC2PRG1P/ CI2PRG1P**

***Course coordinator(s):*** Philippe MORVAN / Pierre-Vincent QUERE

***Assessment details:*** Practical project work

| Year | Semester | Coefficient | Number of hours | | |
|---|---|---|---|---|---|
| | | | Lecture | Tutorial | Project |
| 2nd | 1st and 2nd | 3 | 12 h | 28 h | 20 h |

| | |
|---|---|
| ***Objectives*** | The aim of this class is to introduce students with no prior knowledge to the basis of programming using Python and Sage. |
| | |
| ***Programme*** | Introduction to computer science and programming: history, programming languages, algorithmics, program structures. Python basis: using Python, variables & types, conditional statements, loops. Procedural programming. Recursion notions. Debugging procedures. Write or read files. Introduction to Oriented Object Programming & GUI Programming. Practical work and project (for 4 students) applied to solve problems in mathematics, physics or chemistry. |
| | |
| ***Supporting literature*** | Any Python book for beginners +<br><br>Philippe Morvan : “Introduction à la programmation avec Python” [ENSCR - 2015] |



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## ***Module*: HUMANITIES**

## ***Course*: Communication**

***Course code*:** CI2EXPRC / CC2EXPRC

***Course coordinator(s):*** no coordinator

***Assessment details:*** Oral assessment / project report

| Year | Semester | Coefficient | Number of hours |
|---|---|---|---|
| | | | Lecture |
| 2nd | 2nd | 1,5 | 21 h 20 |

| | |
|---|---|
| ***Objectives*** | To be able to prepare a job interview.<br>To be able to understand relationships inside organization<br>To understand group dynamic<br>To acknowledge chemical industries' job |
| | |
| ***Programme*** | Workshop on professional project<br><br>Exercises of cross interviews<br><br>Investigation on organizations' structure and culture<br><br>Analyzing involvement at work and group dynamic through films and role plays<br><br>Experimenting an interview with someone working in chemical industry |
| | |
| ***Supporting literature*** | Available on request. |



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***Module*: HUMANITIES**

***Course*: Economics (CPI)**

***Course code*:** CC2ECONC

***Course coordinator(s):*** Frédérique PERGOLA

***Assessment details:*** Written assessment

| Year | Semester | Coefficient | Number of hours |
|---|---|---|---|
| | | | Lecture |
| 2nd | 1st | 1,5 | 21 h 20 |

| | |
|---|---|
| ***Objectives*** | To acquire basic economy concepts. |
| | |
| ***Programme*** | Sources of economic growth<br>The Great Recession<br>Sustainable development |
| | |
| ***Supporting literature*** | Available on request. |



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**_Module_: HUMANITIES**

**_Course_: Ethics (CPI)**

***Course code*: CC2ETHIC/CI2ETHIC**

***Course coordinator(s):*** Lise MAILLARD

***Assessment details:*** Written assessment

| Year | Semester | Coefficient | Number of hours |
|---|---|---|---|
| | | | Lecture |
| 2nd | 2nd | 1 | 9 h 20 |

| | |
|---|---|
| ***Objectives*** | To understand the behaviors and rules in the industry<br>To introduce concepts of ethics in the enterprise |
| | |
| ***Programme*** | What is ethics? Financial ethics, professional ethics, enterprise ethics….<br>Importance of human values |
| | |
| ***Supporting literature*** | Available on request. |



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**_Module_: HUMANITIES**

**_Course_: Geopilitics and international openness**

***Course code*: CI2OUINC**

***Course coordinator(s):*** François PRIGENT

***Assessment details:*** Written assessment / project report

| Year | Semester | Coefficient | Number of hours |
|---|---|---|---|
| | | | Lecture |
| 2nd | 1st | 1,5 | 21 h 20 |

| | |
|---|---|
| ***Objectives*** | Students are informed about major questions of international politics and geopolitics tensions in a multicolor reflexion. |
| | |
| ***Programme*** | Major geo-political tension areas.<br>Geopolitic of Sahara-Sahel<br>Geopolitic of Russia<br>Geopolitic of China<br>Geopolitic of United States<br>Study case on a conflict in Middle-East |
| | |
| ***Supporting literature*** | Available on request. |



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**_Module_**: HUMANITIES

**_Course_**: English

**_Course code_**: CC2ANGLD / CI2ANGLD

**_Course coordinator(s):_** Pierre BRIEND / Marcel VIDELO / Roger CONAN/ Anne-Florence MOLLOV

**_Assessment details:_** Written and oral assessment

| Year | Semester | Coefficient | Number of hours |
|---|---|---|---|
| | | | Tutorial |
| 2nd | 1st and 2nd | 5 | 56 h |

| | |
|---|---|
| ***Objectives*** | Consolidation of linguistic and cultural acquisitions<br>Improving oral performance |
| | |
| ***Programme*** | Humour across the world<br>Le SIDA et la société<br>Etude des pays émergents (l'Inde, L'Afrique du Sud …)<br>Film study (example: "Invictus")<br>Oral presentations (free topics) |
| | |
| ***Supporting literature*** | Resources of the Internet<br>Teacher-produced materials |



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***Module*: HUMANITIES**

***Course*: French as a foreign language**

***Course code*:** CI2EFLED

***Course coordinator(s):*** Mélanie TRONEL JEULAND

***Assessment details:*** Written and oral assessment

| Year | Semester | Coefficient | Number of hours |
|---|---|---|---|
| | | | Tutorial |
| 2nd | 1st and 2nd | 5 | 56 h |

| | |
|---|---|
| ***Objectives*** | To give the linguistic tools<br><br>To develop their abilities in verbal and written expression and communication. |
| | |
| ***Programme*** | This course is considered as the continuation and progression of the first and second semesters.<br><br>Like during the first academic year, French-teaching makes use of authentic documents<br><br>Topics: socio-cultural themes approached in the second academic year are chosen in the light of their topicality and in the light of the interests or suggestions of students. |
| | |
| ***Supporting literature*** | http://orthonet.sdv.fr<br><br>www.le pointdufle.net<br><br>http://www.flevideo.com<br><br>http://www.lapressedefrance.fr |



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**_Module_: HUMANITIES**

**_Course_: German**

***Course code*: CC2ALMDD / CI2ALMDD**

***Course coordinator(s):*** Gisela HAUER

***Assessment details:*** Written and oral assessment

| Year | Semester | Coefficient | Number of hours |
|---|---|---|---|
| | | | Tutorial |
| 2nd | 1st and 2nd | 5 | 56 h |

| | |
|---|---|
| ***Objectives*** | To give the linguistic tools<br>To develop their abilities in verbal and written expression and communication. |
| | |
| ***Programme*** | This course is considered as the continuation and progression of the first and second semesters and based on the use of authentic documents.<br>Topics: socio-cultural themes approached in the second academic year are chosen in the light of their topicality and in the light of the interests or suggestions of students. |
| | |
| ***Supporting literature*** | German teaching uses authentic documents and documents adapted for students.<br>http://www.dw.de/deutsch-lernen/top-thema/s-8031<br>http://www.goethe.de/ |



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***Module*: HUMANITIES**

***Course*: Spanish**

***Course code*:** CC2ESPAD/ CI2ESPAD

***Course coordinator(s):*** Antonieta ORE / Luis Miguel GONZALEZ

***Assessment details:*** Written and oral assessment

| Year | Semester | Coefficient | Number of hours |
|---|---|---|---|
| | | | Tutorial |
| 2nd | 1st and 2nd | 5 | 56 h |

| | |
|---|---|
| ***Objectives*** | To give the linguistic tools<br>To develop their abilities in verbal and written expression and communication. |
| | |
| ***Programme*** | This course is considered as the continuation and progression of the first and second semesters and based on the use of authentic documents.<br>Topics: socio-cultural themes approached in the second academic year are chosen in the light of their topicality and in the light of the interests or suggestions of students. |
| | |
| ***Supporting literature*** | Spanish teaching uses authentic documents and documents adapted for students. |



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