

Fall Semester:

SC1 : Principles of Green Chemistry

SC-2 : Optimizing Catalytic Processes: a multi-scale approach

SC-3 : From Catalyst to Industrial Application

SC-4 : Adv. & Green Methods for FG Manipulation

SC-5 : Adv. & Green Methods in Chem. of CC Pi Bonds

SC-6 : Adv. & Green Methods in Carbonyl Chemistry

SC-7 : Structure Determination

SC-8 : Inorganic Nanomaterials Chemistry.

SC-9 : Self-Evolving Molecular Systems

SC-10 : Sustainable Industrial Chemistry

Spring Semester:

Research Internship

PRINCIPLES OF GREEN CHEMISTRY

ECTS	Cours (h)	T.D. (h)	T.P. (h)	Stage (semaines)
3	18	0	0	0

Mention du master transmettant la fiche UE :	Chimie
Composante de gestion de l'UE :	FST, Département Chimie Biochimie
Responsables de l'UE :	ANDRIOLETTI, Bruno
Statut des responsables :	Prof.

COURSE DESCRIPTION / PROGRAMME DE L'UNITE D'ENSEIGNEMENT :

Course objectives: to provide an overview of the principles of green chemistry, and a description of the different approaches adopted by the chemists to decrease the environmental impact of the chemical transformations. A special emphasis will be dedicated to the advanced methods of modern chemistry used in synthesis but also to the different approaches used for optimizing the efficiency of chemical transformations (activation methods, energy saving...). All these aspects will be discussed within the frame of the REACh regulation that drastically modified the chemistry world over the past decade.

- 1) Green Chemistry: a New-Yet-Old concept (Pioneering industrial concepts, new regulations, principles of green chemistry and green chemical engineering)
- 2) New tools for assessing the greenness of a chemical transformation: metrics, Life Cycle Analysis, Toxicity/ecotoxicity...
- 3) Different approaches for limiting the environmental impact of chemical transformations:
 - ✓ Catalysis (heterogeneous catalysis, phase transfer catalysis, homogeneous, biocatalysis, organocatalysis....);
 - ✓ New solvents/reagents (reactions in water, ionic liquids, supercritical CO₂ , fluorinated solvents, new reagents...)
 - ✓ New methods of activation (Microwaves, Ultrasounds, High Pressure and Photochemical activations).

All the classes will consist of seminars and practical examples will be discussed with the students.

Bibliography :

Green Chemistry, an introduction , Mike Lancaster RS.C paperbacks Cambridge 2002

Green Chemistry, P Anastas and TC Williamson , ACS Symposium series 626 Washington 1996

Acquired Skills: a working knowledge of modern tools that can be used for assessing the greenness of a chemical transformation, and the approaches that can be undertaken for limiting the environmental impact of chemical transformations

MUTUALISATION :

Si l'UE est mutualisée avec d'autres mentions de master, indiquez la liste de ces mentions.

- Ouvert aux étudiants ERASMUS en semestre d'échange à l'UCBL1
- Ouvert aux parcours du master chimie
- Ouvert au master SOAC
- Ouvert aux étudiants du programme Erasmus Mondus SINCEM: The European Doctoral Programme on Sustainable Industrial Chemistry et aux étudiants de l'Ecole Doctorale de Chimie de Lyon

OPTIMIZING CATALYTIC PROCESSES: A MULTI-SCALE APPROACH

ECTS	Cours (h)	T.D. (h)	T.P. (h)	Stage (semaines)
3	18	0	0	0

Mention du master transmettant la fiche UE :	Chimie
Composante de gestion de l'UE :	FST, Département Chimie Biochimie
Responsables de l'UE :	FONGARLAND, Pascal
Statut des responsables :	PR

COURSE DESCRIPTION / PROGRAMME DE L'UNITE D'ENSEIGNEMENT :

Course objectives:

The course objective is to provide an overview of different strategies for the optimization of a catalytic process, covering from the molecular level to the reactor as a multi-scale approach. Students will discover that chemical optimization is not related only to a reactivity issue at the molecular level, but also to several others factors (competition between reaction and mass transfer diffusion, impact of reactor configuration, thermodynamics ...). Some methodological tools coming from quantum chemistry, physical chemistry, and chemical engineering will be presented and used by the students. At the end, we will see how this multi-scale approach is used to optimize selectivity and productivity of a catalytic process, and finally the concept of process intensification.

For the molecular scale, the aim is to present a modern quantum interpretation of chemical reactivity and selectivity. The introduced concepts are easily understandable for chemists and only necessitate a basic knowledge of quantum chemistry. This part will include:

- 1) Framework of Density Functional Theory and basis of Conceptual DFT
- 2) Global Descriptors for Chemical Reactivity
- 3) Local Descriptors for Chemical Selectivity

Concerning the macro scale, we will first present how to represent the kinetic of chemical reaction without and with a catalyst. Different methodology to estimate the kinetic parameters will be proposed including theory kinetic of gases, thermodynamic and related to the first part of the course, ab-initio computation. Concepts of active sites in heterogeneous catalyst will allows to better understand the relation observed between catalyst structure and reactivity.

In a second step, some elementary basis will be given on chemical reactors (continuous plug flow or agitated reactor, batch vs continuous reactor) easily understandable for chemists and their impacts on the products yield or the reactor volume required to attain a given conversion. The concept of apparent rate will be provided and let us introduced the influence that can have some physical phenomena like mass transfer on the chemical process performances. Students will be able to perform simple calculations in order to scale simply an operational unit.

Acquired Skills: a knowledge of modern description of chemical reactivity with the help of conceptual DFT, a knowledge of methodology to compute kinetic constant using different scales, a knowledge relative to performance of ideal reactors, a knowledge of the coupling between chemical reaction and molecular diffusion, a knowledge of a multi-scale approach to optimize a catalytic reaction.

MUTUALISATION :

Si l'UE est mutualisée avec d'autres mentions de master, indiquez la liste de ces mentions.

- Ouvert aux étudiants ERASMUS en semestre d'échange à l'UCBL1
- Ouvert aux parcours du master chimie
- Ouvert au master SOAC
- Ouvert aux étudiants du programme Erasmus Mondus SINCEM: The European Doctoral Programme on Sustainable Industrial Chemistry et aux étudiants de l'Ecole Doctorale de Chimie de Lyon

FROM CATALYST TO INDUSTRIAL APPLICATION

ECTS	Cours (h)	T.D. (h)	T.P. (h)	Stage (semaines)
3	18	0	0	0

Mention du master transmettant la fiche UE :

Chimie

Composante de gestion de l'UE :

FST, Département Chimie Biochimie

Responsables de l'UE :

GIROIR-FENDLER, Anne

Statut des responsables :

PR

COURSE DESCRIPTION / PROGRAMME DE L'UNITE D'ENSEIGNEMENT :

Course objectives: To provide an overview of catalytic activation processes focusing here on the preparation and characterization of heterogeneous catalysts, as well as of the current efforts at developing new methodologies to identify the active sites, elucidate mechanisms, and measure the rate of the chemical reaction.

Catalysts

- Homogeneous (organometallic and enzymatic)
- Heterogeneous (catalytic materials, active sites deposited at the surface)
- Methods of synthesis and deposition of active sites

Physico chemical characterizations

- Textural (specific surface area, porosity)
- Structural (crystallinity, phase identification)
- Morphology of the active sites (nanoscale)
- Chemisorptions (surface characterization, surface properties)

Reactivity

- Activity and selectivity
- Macro kinetics
- Micro kinetics

Acquired Skills: A working knowledge of preparation (homogeneous and heterogeneous) and characterization (textural, structural and identification of active sites) of catalysts, a knowledge of the mechanisms and the kinetic approaches used to describe the catalytic process. The course will provide illustrations with examples of industrial scale applications in the field of the green chemistry

MUTUALISATION :

Si l'UE est mutualisée avec d'autres mentions de master, indiquez la liste de ces mentions.

- Ouvert aux étudiants ERASMUS en semestre d'échange à l'UCBL1
- Ouvert aux parcours du master chimie
- Ouvert au master SOAC
- Ouvert aux étudiants du programme Erasmus Mondus SINCEM: The European Doctoral Programme on Sustainable Industrial Chemistry et aux étudiants de l'Ecole Doctorale de Chimie de Lyon

ADVANCED AND GREEN METHODS FOR FUNCTIONAL GROUP MANIPULATION

ECTS	Cours (h)	T.D. (h)	T.P. (h)	Stage (semaines)
3	18	0	0	0

Mention du master transmettant la fiche UE :

Chimie

Composante de gestion de l'UE :

FST, Département Chimie Biochimie

Responsables de l'UE :

STRAZEWSKI, Pierre

Statut des responsables :

PR

COURSE DESCRIPTION / PROGRAMME DE L'UNITE D'ENSEIGNEMENT :

Course objectives: to provide an overview of advanced methods of modern synthetic chemistry, focusing here on functional group conversions, as well as of the current efforts at developing sustainable alternatives. Starting with some of the classical reactions from the undergraduate program, we will provide advanced methods, asymmetric versions (with an overview of the major transition state models), 'greener' methods, and examples in total synthesis.

Carbonyl reduction reactions

- Advanced methods
- Asymmetric versions
- Sustainable methods

Alkene reductions

- Advanced methods
- Asymmetric versions
- Sustainable methods

Alcohol oxidation reactions

- Advanced methods
- Asymmetric versions
- Sustainable methods

The dihydroxylation reaction

- Idem

Epoxidation reactions

- Idem

Nucleophilic substitution reactions

- Idem

Elimination reactions

- Idem

Radical substitution reactions

- Idem

FG conversions in total synthesis

Acquired Skills: a working knowledge of modern synthetic methods in functional group chemistry, a knowledge of the major transition state models used to predict the stereochemical outcome of asymmetric reactions, and the ability to read and understand the reactions, selectivities and specificities, and retrosynthetic strategy of the total synthesis of a complex natural product

MUTUALISATION :

Si l'UE est mutualisée avec d'autres mentions de master, indiquez la liste de ces mentions.

- Ouvert aux étudiants ERASMUS en semestre d'échange à l'UCBL1
- Ouvert aux parcours du master chimie
- Ouvert au master SOAC
- Ouvert aux étudiants du programme Erasmus Mondus SINCEM: The European Doctoral Programme on Sustainable Industrial Chemistry et aux étudiants de l'Ecole Doctorale de Chimie de Lyon

ADVANCED AND GREEN METHODS IN THE CHEMISTRY OF CC PI BONDS

ECTS	Cours (h)	T.D. (h)	T.P. (h)	Stage (semaines)
3	18	0	0	0

Mention du master transmettant la fiche UE :	Chimie
Composante de gestion de l'UE :	FST, Département Chimie Biochimie
Responsables de l'UE :	PIVA, Olivier
Statut des responsables :	PR

COURSE DESCRIPTION / PROGRAMME DE L'UNITE D'ENSEIGNEMENT :

Course objectives: to provide an overview of advanced methods of modern synthetic chemistry, focusing here on the chemistry of C=C II bonds, as well as of the current efforts at developing sustainable alternatives. Starting with some of the classical reactions from the undergraduate program, we will provide modern variants, asymmetric versions (with an overview of the major transition state models), "greener" methods, and examples in total synthesis.

The Diels Alder reaction

- Advanced methods
- Asymmetric versions (rel. diastereoselection, induction, "enantioselective" versions)
- Sustainable methods
- Total synthesis

[3+2] Dipolar Cycloaddition reactions

- Advanced methods
- Asymmetric versions
- Sustainable methods
- Total synthesis

The Suzuki reaction

- idem

The Olefin Metathesis reaction

- idem

Directed metallation reactions

- idem

Radical cyclisation reactions

- idem

Photochemical processes

- Photon as a green reagent
- Applications in natural product synthesis

Acquired Skills: a working knowledge of modern synthetic methods in the chemistry of C=C II bonds, a knowledge of the major transition state models used to predict the stereochemical outcome of asymmetric reactions, and the ability to read and understand the reactions, selectivities and specificities, and retrosynthetic strategy of the total synthesis of a complex natural product

MUTUALISATION :

Si l'UE est mutualisée avec d'autres mentions de master, indiquez la liste de ces mentions.

- Ouvert aux étudiants ERASMUS en semestre d'échange à l'UCBL1
- Ouvert aux parcours du master chimie
- Ouvert au master SOAC
- Ouvert aux étudiants du programme Erasmus Mondus SINCEM: The European Doctoral Programme on Sustainable Industrial Chemistry et aux étudiants de l'Ecole Doctorale de Chimie de Lyon

ADVANCED AND GREEN METHODS IN CARBONYL CHEMISTRY

ECTS	Cours (h)	T.D. (h)	T.P. (h)	Stage (semaines)
3	18	0	0	0

Mention du master transmettant la fiche UE :	Chimie
Composante de gestion de l'UE :	FST, Département Chimie Biochimie
Responsables de l'UE :	GOEKJIAN, Peter
Statut des responsables :	PR

COURSE DESCRIPTION / PROGRAMME DE L'UNITE D'ENSEIGNEMENT :

Course objectives: to provide an overview of advanced methods of modern synthetic chemistry, focusing here on carbon-carbon bond forming carbonyl reactions, as well as of the current efforts at developing sustainable alternatives. Starting with some of the classical reactions from the undergraduate program, we will provide modern variants, asymmetric versions (with an overview of the major transition state models), "greener" methods, and examples in total synthesis.

The Grignard reaction

- Advanced methods
- Asymmetric versions
- Sustainable methods
- Total synthesis

The Aldol reaction

- Advanced methods
- Asymmetric versions
- Sustainable methods
- Total synthesis

The Wittig reaction

- Advanced methods
- Asymmetric versions
- Sustainable methods
- Total synthesis

Conjugate addition reactions

- Advanced methods
- Asymmetric versions
- Sustainable methods
- Total synthesis

Alpha substitution reactions

- Advanced methods
- Asymmetric versions
- Sustainable methods

Acquired Skills: a working knowledge of modern synthetic methods in carbonyl chemistry, a knowledge of the major transition state models used to predict the stereochemical outcome of asymmetric reactions, and the ability to read and understand the reactions, selectivities and specificities, and retrosynthetic strategy of the total synthesis of a complex natural product

MUTUALISATION :

Si l'UE est mutualisée avec d'autres mentions de master, indiquez la liste de ces mentions.

- Ouvert aux étudiants ERASMUS en semestre d'échange à l'UCBL1
- Ouvert aux parcours du master chimie
- Ouvert au master SOAC
- Ouvert aux étudiants du programme Erasmus Mondus SINCEM: The European Doctoral Programme on Sustainable Industrial Chemistry et aux étudiants de l'Ecole Doctorale de Chimie de Lyon

INORGANIC NANOMATERIALS

ECTS	Cours (h)	T.D. (h)	T.P. (h)	Stage (semaines)
3	18	0	0	0

Mention du master transmettant la fiche UE :	Chimie
Composante de gestion de l'UE :	FST, Département Chimie Biochimie
Responsables de l'UE :	MISHRA, Shashank
Statut des responsables :	MCF

COURSE DESCRIPTION / PROGRAMME DE L'UNITE D'ENSEIGNEMENT :

Course objectives: To provide an overview of different soft chemical synthetic methods of inorganic nanomaterials (coprecipitation, microemulsions, sol-gel processing, Chemical Vapor deposition, etc.). Starting with the fundamentals of the field 'nanomaterials', this course will provide an understanding of the underlying principles and theories of the synthetic methodologies and their applications in different fields of research including catalysis.

- 1. Different classes of nanomaterials and their special properties**
- 2. Liquid-phase synthesis**
 - 2.1 From aqueous solutions: Coprecipitation
 - 2.2 From organic solution: Sol-Gel processing
 - Molecular precursors (metal alkoxides, carboxylates, β -diketonates...)
 - Molecular engineering and hybrid materials
 - 2.3. From Aqueous/Organic solution: Microemulsion synthetic methods
- 3. Gas-phase synthesis: Chemical Vapor Deposition (CVD)**
 - Fundamentals of CVD
 - Selection of suitable precursors
 - Deposition of thin films of metals, metal oxides, nitrides, fluorides...
- 4. Applications**

Acquired Skills: A working knowledge of different synthetic methods of inorganic nanomaterials using bottom-up approach, ability to design the molecular precursors and their use in chemical solution and –vapor phase deposition methods to get nanoparticles, thin films, and inorganic-organic hybrid materials.

MUTUALISATION :

Si l'UE est mutualisée avec d'autres mentions de master, indiquez la liste de ces mentions.

- Ouvert aux étudiants ERASMUS en semestre d'échange à l'UCBL1
- Ouvert aux parcours du master chimie
- Ouvert au master SOAC
- Ouvert aux étudiants du programme Erasmus Mondus SINCHEM: The European Doctoral Programme on Sustainable Industrial Chemistry et aux étudiants de l'Ecole Doctorale de Chimie de Lyon

STRUCTURE DETERMINATION

ECTS	Cours (h)	T.D. (h)	T.P. (h)	Stage (semaines)
3	18	0	0	0

Mention du master transmettant la fiche UE :	Chimie
Composante de gestion de l'UE :	FST, Département Chimie Biochimie
Responsables de l'UE :	GOEKJIAN, Peter
Statut des responsables :	PR

COURSE DESCRIPTION / PROGRAMME DE L'UNITE D'ENSEIGNEMENT :

Course objectives: Determining the exact structure of the compound, catalyst, or material that we have synthesized (as opposed to the structure we *expected* to synthesize) is the most critical step in modern research and development. The course will provide an overview of the major methods for structural determination, with an emphasis on the practical aspects, the choice of methods, and the interpretation of the results.

Among the methods covered in the course:

Nuclear Magnetic Resonance
Infrared and Raman spectroscopy
Mass spectrometry
UV-Vis spectroscopy
Electron Spin Resonance
X-ray diffraction and SAXS
EXAFS, XPS, Mossbauer
Dynamic light scattering

The bulk of the coursework will be on the first four methods.

Acquired Skills: a working knowledge of the major modern methods of structure determination, which a focus on molecular structures, but also including mixtures, supramolecular assemblies, and materials. The student will know how to chose the most appropriate methods of structure determination, and to interpret the results of these experiments.

MUTUALISATION :

Si l'UE est mutualisée avec d'autres mentions de master, indiquez la liste de ces mentions.

- Ouvert aux étudiants ERASMUS en semestre d'échange à l'UCBL1
- Ouvert aux parcours du master chimie
- Ouvert au master SOAC
- Ouvert aux étudiants du programme Erasmus Mondus SINCEM: The European Doctoral Programme on Sustainable Industrial Chemistry et aux étudiants de l'Ecole Doctorale de Chimie de Lyon

SELF-EVOLVING MOLECULAR SYSTEMS

ECTS	Cours (h)	T.D. (h)	T.P. (h)	Stage (semaines)
3	18	0	0	0

Mention du master transmettant la fiche UE :	Chimie
Composante de gestion de l'UE :	FST, Département Chimie Biochimie
Responsables de l'UE :	STRAZEWSKI, Pierre
Statut des responsables :	PR

COURSE DESCRIPTION / PROGRAMME DE L'UNITE D'ENSEIGNEMENT :

Course objectives: to provide an overview of the current state-of-the-art in Systems Chemistry, and where this relatively young chemical field is heading for. Systems Chemistry aims at demonstrating and reconstructing the accumulation of complex matter, in order to find the chemical roots of biological organization. The main issue of the course is to study on a timeline the spontaneous growth in size, abundance and organization of organic molecular systems.

The spontaneous formation of the building blocks of life

Amino acids from the elements H, C, O, N and S; long chain alcohols and carboxylic acids from dihydrogen and carbon monoxide, aromatic N-heterocycles from simple precursors like hydrogen cyanide, formamide, guanidine or cyanamide; carbohydrates from formaldehyde: the formose reaction; nucleosides from N-heterocycles and carbohydrates; alternatives to the classical prebiotic reaction pathways

Spontaneous condensation reactions of the building blocks of life

Peptides from amino acids; oligosaccharides from simple sugars; nucleic acids from nucleosides and phosphate ; lipids and fats from glycerol, amino alcohols, phosphate and long chain carboxylic (fatty) acids; mixed conjugates from lipids and sugars, peptides and nucleic acids, lipids and nucleic acids, etc.

Molecular and supramolecular properties of organic macromolecules

Liposomes from lipids; globular aggregations and extended architectures from peptides; folded nucleic acids; the interaction of organic macromolecules with small organic molecules; the interaction of liposomes with organic macromolecules

Systemic approach to the chemical origin of life

Boundaries for compartmented chemical systems from organic amphiphiles; self-templating nucleic acids and peptides; autocatalytic and crosscatalytic chemical reaction networks; the origin of homochirality; compartmented templating reactions and catalytic reaction networks; growth and division of natural compartments

What is life? How Chemistry becomes Biology

How to keep a dynamic chemical system out of thermodynamic equilibrium; the concept of dynamic kinetic stability; how to maintain the concentration of useful catalysts in a replicating chemical system over many generations; the concept of evolvability and self-evolvability; self-evolving synthetic living cells from the entirely inanimate

Evolvable molecular systems for sustainable development

Non biotic evolvable systems; perspectives for evolvable catalysts and materials

Acquired Skills: an understanding of the fundamental requirements underlying evolvable molecular systems; a knowledge of the biomolecules and of their interactions, and of the hierarchy of compositional and dynamic chemical complexity; a conceptual distinction between chemical building blocks, composition, complexity of composition on the one hand, and chemical transformation, dynamics and complexity of chemical interactions on the other.

MUTUALISATION :

Si l'UE est mutualisée avec d'autres mentions de master, indiquez la liste de ces mentions.

- Ouvert aux étudiants ERASMUS en semestre d'échange à l'UCBL1
- Ouvert aux parcours du master chimie
- Ouvert au master SOAC

Ouvert aux étudiants du programme Erasmus Mondus SINCEM: The European Doctoral Programme on Sustainable Industrial Chemistry et aux étudiants de l'Ecole Doctorale de Chimie de Lyon

SUSTAINABLE INDUSTRIAL CHEMISTRY

ECTS	Cours (h)	T.D. (h)	T.P. (h)	Stage (semaines)
3	18	0	0	0

Mention du master transmettant la fiche UE :	Chimie
Composante de gestion de l'UE :	FST, Département Chimie Biochimie
Responsables de l'UE :	ANDRIOLETTI, Bruno
Statut des responsables :	Prof.

COURSE DESCRIPTION / PROGRAMME DE L'UNITE D'ENSEIGNEMENT :

Course objectives: to provide an overview of the new trends in designing industrial chemical processes which are environmentally friendly and economically feasible. Selected examples (from bulk to fine chemistry) taken from contributions by experts from industry will highlight the possibilities of running industrial chemical processes in a sustainable manner and we will discuss the challenges and opportunities for the future.

Different aspects will be described and discussed such as

- 1° the use of renewable raw materials,
- 2) the use of alternative energy sources in chemical processes,
- 3) the design of intrinsically safe processes involving the use of microreactor, process optimization and integrated reaction,
- 4) New separation technologies, waste reduction, new catalytic routes and/or solvent and process optimization.

All the classes will consist of seminars and practical examples will be discussed with the students.

Bibliography:

Sustainable Industrial Chemistry: Principles, Tools and Industrial Examples
 Fabrizio Cavani (Editor), Gabriele Centi (Editor), Siglinda Perathoner (Editor), Ferruccio Trifiro (Editor)
 ISBN: 978-3-527-31552-9; October 2009

Acquired Skills: a working knowledge of modern approaches currently used in industry for 1) limiting the environmental impact of the chemical transformation, 2) limiting the risks for the chemists and the users, 3) economical optimization

MUTUALISATION :

Si l'UE est mutualisée avec d'autres mentions de master, indiquez la liste de ces mentions.

- Ouvert aux étudiants ERASMUS en semestre d'échange à l'UCBL1
- Ouvert aux parcours du master chimie
- Ouvert au master SOAC
- Ouvert aux étudiants du programme Erasmus Mondus SINCHEM: The European Doctoral Programme on Sustainable Industrial Chemistry et aux étudiants de l'Ecole Doctorale de Chimie de Lyon

EXPERIMENTAL TRAINING

ECTS	Cours (h)	T.D. (h)	T.P. (h)	Stage (semaines)	Soutien (h)
30	-	-	-	>20	-

Composante de gestion de l'UE :

UFR Sciences et Technologies ; Département de Chimie et Biochimie

Responsable de l'UE :

GOEKJIAN Peter

Statut du responsable :

PR

PROGRAMME DE L'UNITE D'ENSEIGNEMENT :

A research internship of at least 5 months in a research laboratory in a CNRS/Universite Lyon 1 or CNRS/ENS mixed research unit (UMR). The research internship can also be done in any company or academic laboratory worldwide.

A research report and an oral présentation / défense in front of a committee of the faculty from the specialty.

Modalités d'évaluation

(données à titre indicatif : les modalités précises sont votées tous les ans par le CA sur proposition du CEVU)

<input type="checkbox"/> Interrogation(s) orale(s)	<input checked="" type="checkbox"/> Rapport / mémoire	<input type="checkbox"/> Exposé(s)
<input type="checkbox"/> Examen(s) écrit(s)	<input type="checkbox"/> Compte-rendu(s) de travaux pratiques	<input type="checkbox"/> Epreuve(s) physique(s)/ artistique(s)
<input checked="" type="checkbox"/> Soutenance de stage ou projet	<input type="checkbox"/> Autre(s) production(s) (vidéo, poster, logiciel...)	
<input checked="" type="checkbox"/> Note de déroulement de stage	<input type="checkbox"/> Autre (préciser) :	