Study Plan

School: School of Sciences and Technology
Degree: Bachelor
Course: Chemistry (cód. 605)

1st Year - 1st Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI11958L	Principles and Methods in Chemistry	Chemistry	9	Semester	234
QUI11459L	Lab Techniques and Methods I	Chemistry	3	Semester	78
MAT11959L	Biostatistics with Computer Software	Mathematics	6	Semester	156
MAT11960L	Mathematics I	Mathematics	6	Semester	156
FIS11961L	Physics 1.1	Physics	6	Semester	156

1st Year - 2nd Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI01084L	Physical Chemistry I	Chemistry	6	Semester	156
QUI11962L	Organic Chemistry I	Chemistry	6	Semester	156
QUI11464L	Lab Techniques and Methods II	Chemistry	3	Semester	78
QUI11963L	Principles and Methods in Biochemistry and Bioinorganics	Biochemistry	9	Semester	234
MAT11964L	Mathematics II	Mathematics	6	Semester	156

2nd Year - 3rd Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI11965L	Inorganic Chemistry I	Chemistry	6	Semester	156
QUI11966L	Analytical Chemistry I	Chemistry	6	Semester	156
QUI11967L	Organic Chemistry II	Chemistry	6	Semester	156
QUI01051L	Advanced Chemistry Laboratory I	Chemistry	6	Semester	156
INF11968L	Introduction to Programming	Informatics	6	Semester	156

2nd Year - 4th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI11969L	Inorganic Chemistry II	Chemistry	6	Semester	156
QUI11970L	Analytical Chemistry II	Chemistry	6	Semester	156
QUI11971L	Physical Chemistry II	Chemistry	6	Semester	156

2nd Year - 4th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI11972L	Advanced Chemistry Laboratory II	Chemistry	6	Semester	156
FIS11973L	Physics 1.2	Physics	6	Semester	156

3rd Year - 5th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI07212L	Colloids and Interfaces	Chemistry	6	Semester	156
QUI11974L	Chemical Synthesis	Chemistry	6	Semester	156
QUI11975L	Physical Chemistry III	Chemistry	6	Semester	156
QUI07218L	Computational Chemistry	Chemistry	6	Semester	156
QUI11976L	* Scientific Training	Chemistry	15	Semester	390

Group of Options

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI00348L	Biochemistry	Biochemistry	6	Semester	156
QUI11977L	Introduction to Quality Control	Chemical and Biochemical Engineering	6	Semester	156
QUI11978L	Industrial Chemistry	Chemical and Biochemical Engineering	6	Semester	156
QUI11979L	Water Treatment and Wastewater	Chemical and Biochemical Engineering	3	Semester	78
QUI01056L	Carbon Based Materials	Chemistry	6	Semester	156
QUI11980L	Chemistry Applied to Heritage	Chemistry	6	Semester	156
QUI11981L	Chemistry of Materials	Chemistry	6	Semester	156
QUI01080L	Chemistry of Natural Products	Chemistry	3	Semester	78
QUI11982L	Chemistry of Natural Systems	Chemistry	6	Semester	156
QUI11983L	Forensic Chemistry	Chemistry	6	Semester	156
QUI01109L	Molecular Simulation	Chemistry	6	Semester	156
QUI11984L	Solids and Surfaces	Chemistry	6	Semester	156

***** TRANSLATE ME:UC's do 3º Ano de recuperação no 5º semestre *****

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI11976L	* Scientific Training	Chemistry	15	Semester	390

3rd Year - 6th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI01062L	Scope of Present Chemistry	Non Available	3	Semester	78
QUI11976L	Scientific Training	Chemistry	15	Semester	390

Group of Options

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
ECN11985L	Current Economic Topics	Economy	6	Semester	156
FIL11986L	Critical Thinking and Argumentation	Philosophy	6	Semester	156
GES02310L	Entrepreneurship and Innovation	Management	6	Semester	156

Group of Free Options

Conditions for obtaining the Degree:

*** TRANSLATE ME: Para obtenção do grau de licenciado em Química é necessário obter aprovação a 162 ECTS em unidades curriculares obrigatórias e 18 ECTS em unidades curriculares optativas, distribuídas da seguinte forma:

1º Ano

1º Semestre:

5 UC Obrigatórias num total de 30 ECTS

2º Semestre:

5 UC Obrigatórias num total de 30 ECTS

2º Ano

3º Semestre:

5 UC Obrigatórias num total de 30 ECTS

4º Semestre:

5 UC Obrigatórias num total de 30 ECTS

3º Ano

5º Semestre:

4 UC Obrigatórias num total de 24 ECTS

1 UC Optativa do Grupo I num total de 6 ECTS

6º Semestre:

2 UC Obrigatórias num total de 18 ECTS

2 Optativas, uma livre e outra do Grupo II, num total de 12 ECTS ***

Program Contents

Back

Principles and Methods in Chemistry (QUI11958L)

Atomic theory and evolution of the atomic models. Quantum theory and electronic structure of atoms. Periodic relations between the elements. Basic concepts of chemical bonding. Ionic bonding. Covalent bonding (Lewis structures, VSEPR model, VB theory, MO theory). Molecular interactions. States of aggregation. Gas equations. Perfect gas mixtures. Chemical thermodynamics. Phase equilibrium. Properties of solutions. General aspects of chemical equilibrium in ideal systems. Acid-base, solubility, complexation and oxidation-reduction equilibria. Electrochemistry. Chemical kinetics.

Back

Lab Techniques and Methods I (QUI11459L)

Back

Biostatistics with Computer Software (MAT11959L)

One-dimensional and two-dimensional descriptive statistics.
Probability topics. Random variables. Distribution function.
Discrete and continuous probability distributions.
Sampling. Sampling distributions.
Point estimation and confidence intervals
Tests for the mean, variance, proportion, comparison of means (independent samples and paired samples), comparison of variances and comparison of proportions. Analysis of variance. Nonparametric tests.
Use of programs on the MS Windows. MS Excel. SPSS statistical software.

Back

Mathematics I (MAT11960L)

1. Topological concepts in IR
2. Differential calculus in IR: Derivative at a point and physical interpretation. Rules of derivation. Rolle, Lagrange and Cauchy Theorems. L'Hôpital and Cauchy Rules. Monotonicity, concavity and asymptotes.
3. Primitives: Primitives. Primitives by parts and by substitution. Primitives of rational functions.
4. Integration: Integral of Darboux and Riemann. Properties of the integral. The fundamental theorem of calculus and Barrow's formula. Integration by parts and substitution.
5. Applications of integral calculus: Areas. Length of a line. Volumes and areas of solids of revolution.
6. Improper integrals: Convergence theorems. Absolute Convergence.
7. Numerical series: Geometric and Mengoli series. Nonnegative real series. Alternating series. Absolute convergence.
8. Power series: Definitions. Taylor and Mac-Laurin series.
9. ODE: Homogeneous non-homogeneous linear ODE of order n. Applications

Back

Physics 1.1 (FIS11961L)

Introduction ; Physics and measurements; Vectors
Trajectory; velocity and acceleration.
Force and mass; Newton's dynamic laws; Momentum and momentum conservation; Work; Principle of conservation of energy.
Rotation; Angular displacement, angular velocity, angular acceleration; Torque about an axis. Kinetic energy of rotation; Angular momentum; conservation of angular momentum. Gravity
Temperature and heat; thermal expansion; Heat and internal energy; State changes; The transfer of heat; The ideal gas law and kinetic theory; The first law of thermodynamics; The second law of thermodynamics.
Electromagnetic waves; properties of light; Optical images

Back

Physical Chemistry I (QUI01084L)

Back

Organic Chemistry I (QUI11962L)

Classification and nomenclature of organic compounds. The chemical bond in organic molecules. Drawing molecules. Constitutional isomers. Stereoisomers and conformational analysis. Electronic structure of organic molecules. Reactivity of organic molecules. Nucleophilic substitution at saturated carbon. Elimination reactions. Electrophilic addition to alkenes. Electrophilic aromatic substitution reactions. Accomplishment of laboratory experiments for the application of fundamental techniques of synthesis, extraction, isolation and identification of organic compounds.

Back

Lab Techniques and Methods II (QUI11464L)

Back

Principles and Methods in Biochemistry and Bioinorganics (QUI11963L)

Biochemistry: Living Organisms: structure of prokaryotic and eukaryotic cells. Methodology and technical approaches used in Biochemistry. Water: the medium of life. Inorganic ions in biologic systems. Physiologic buffers. Functional characteristics of biomolecules. Carbohydrates, Aminoacids, peptides and proteins Classification of metallic biomolecules. Main biochemical functions of metal ions. Nucleotides and nucleic acids. Lipids,and lipoproteins. Structure and properties of biomembranes. Enzymes and enzymatic kinetic. Bioenergetics and Bioelectrochemistry. The role of ATP in biological processes. Introduction to the metabolism. Anabolic and biosynthesis processes. The major metabolic pathways. Some applications of bioinorganic biochemistry. The role of inorganic elements in the life: essential elements, toxic elements and their use in therapeutic and diagnostic practices. Biodistribuition of inorganic elements and interaction with biomolecules and specific function in the life.

Back

Mathematics II (MAT11964L)

I – Linear Algebra
1. Vector spaces and subspaces
2. Linear functions
3. Matrices and Linear Systems of Equations
4. Determinants
5. Eigenvalues and eigenvectors

II – Differential Calculus in ℝn
1. Dot, crossed and mixed products
2. Topology
3. Scalar and Vector Fields
4. Limits and Continuity
5. Differential calculus

Back

Inorganic Chemistry I (QUI11965L)

Introduction to inorganic chemistry: background, classes of inorganic compounds, structures and inorganic reactions. The Periodic Table, chemistry, occurrence, recovery and uses of the elements and its compounds. An introduction to the coordination compounds: structure, representative ligands, nomenclature and isomerism. Electronic structure and spectra of d-metal complexes. d-Metal organometallic chemistry: basic concepts, structure and chemical bonding. Laboratory module: a set of laboratory experiments is included in the "Advanced Laboratory of Chemistry I" course.

Back

Analytical Chemistry I (QUI11966L)

1. Solubility and precipitation. Separation by selective precipitation. Qualitative analysis of cations. Properties of precipitates and precipitation reragents. Gravimetric analysis. 2. General aspects of volumetric titrations. Standard solutions and standardization. Equivalence and final points. Required characteristics of titration reactions. Direct and back-titrations. 3. Precipitation titrations. Methods of Mohr, Charpentier-Volhard and Fajans. Titration curves of one analyte and of mixtures. 4. Acid-base titrations. Buffers. Titration curves for simple and complex systems. Indicators. 5. Complex formation titrations. EDTA Titrations. Titration curves of simple and complex mixtures. Use of metallochromic indicators and of auxiliary complexing agents. 7. Redox titrations. Use of pre-oxidizing and pre-reducing agents. Titration curves of simple and complex systems. Indicators. 8. Thermal analysis.

Back

Organic Chemistry II (QUI11967L)

1. Carbonyl Compounds. Aldehydes and ketones, Electronic structure. Reactions: Nucleophilic addition reactions, including the aldol and its significance in biosynthesis.
-dicarbonyl and -unsaturated compounds. Acidity, the malonic ester and acetoacetic ester synthesis, the Micheal addition and the Claisen condensation reaction.
Carboxylic acids and their derivatives. Synthesis and interconversion between carboxylic acid derivatives.
2. Stereochemistry. Fundamental concepts. Chiral compounds without central chirality.
3. Relevance of carbonyl compounds in medicinal and pharmaceutical chemistry.
4. Spectrocopic Methods in Organic Chemistry. Nuclear Magnetic Ressonance (NMR) 1H e 13C, Infra-Red spectroscopy, UV/VIS spectroscopy, Mass spectrometry.

Back

Advanced Chemistry Laboratory I (QUI01051L)

The three components include: a) Preparation and characterisation of inorganic compounds. b) Use of several analytical techniques. c) synthesis of organic compounds. d) data analysis. e) laboratory work planning.

Back

Introduction to Programming (INF11968L)

Introduction to Programming with Python language
Use of interpreter in script and interactive modes
Variables, expressions and statements
Defining and Using Functions
Control structures
Native data structures
Sequential data structures: lists, tuples and strings.
Associative data structures: dictionaries.
Basics of input / output (I / O)
File manipulation
Graphic interface
Use of libraries
Libraries with advanced functionality for scientific calculation
Program development

Back

Inorganic Chemistry II (QUI11969L)

Packing, unit cells and interstitial space in crystalline solids. Representative structures of inorganic solids. Metallic alloys. Crystalline systems, Bravais lattices and Miller indexes. Characterisation by X ray diffraction (powder method). Energetics of ionic solid formation. Band theory. Defects in crystals. Mechanisms and kinetics of reactions in aqueous phase. Sol-gel process.

Back

Analytical Chemistry II (QUI11970L)

Chromatographic methods: Statistics and chemometrics for analytical chemistry. Quantification methodology when using a chromatografic method of analysis. Sample preparation methodology for different sample materials: solid, liquid and gases. Chromatographic methods of analysis: HPLC, GC and CE. Different detectors with a special emphasis on the mass detector. Use of recent literature to illustrate the use of the different chromatographic techniques in different scientific areas.

Electrochemical Methods: Static interfacial methods. Dynamic interfacial methods, with total or partial controlled potential. Galvanostatic dynamic interfacial methods and bulk methods. Considerations about the experimental work. Results, its analysis and interpretation. Quantification of analytes by electrochemical methods. Detection limits and quantification. Use of recent literature to illustrate the use of the different electrochemical techniques in different scientific areas.

Back

Physical Chemistry II (QUI11971L)

The failures of classic mechanics. The origins of the quantum mechanics. The Schrödinger equation and the information contained in its solutions: average values probabilities. Heisenberg uncertainty principle. Quantum descriptions of the translaccional motion (particle in the box), vibracional motion (harmónico oscillator) and rotational motion (circular movement, rotation in a spherical surface). Structure of hidrogenoid and polielectronic atoms. Molecular structure. Molecular orbitals theory for polyatomic molecules. Variacional principle. Hückel method. Kinetic empirical chemistry. Elementary and complex reactions. The stationary state approach. Unimolecular reactions. Enzymatic catalysis. Chain reactions. Polymerization reactions. The collisions theory and the activated complex theory.

Back

Advanced Chemistry Laboratory II (QUI11972L)

The components of the unit include: a) synthesis, reactivity and characterisation of ceramic materials; b) construction and interpretation of models of inorganic solids; c) analysis and purification of complex mixtures; d) problems in quantum mechanics (fundamentals, applications to atomic and molecular structure), chemical kinetics and reaction mechanisms.

Back

Physics 1.2 (FIS11973L)

Stress and Strain; Elasticity, plasticity, fracture and rupture, Elasticity's Modulus; Strain by twist and flexion.
Fluids; Fluid properties, Hydrostatics, Buoyancy and Archimedes' principle. Fluid motion. Equation of conservation of mass, of momentum and of energy: Flow without viscosity and non-rotational. Fluids with viscosity. Poiseuille's law. Surface tension and capillarity.
Waves and vibrations; Propagation of mechanical waves in solid and fluid media, Wave function. Plane and spherical waves. Interference and wave superposition. Some examples.
Electricity and Magnetism: Coulomb laws. Electric field. Electric potential. Condensors. Electric current. Forces originated by magnetic fields. Biot-Savart's Law, Gauss's Law, Ampere's Law. Magnetic induction, Faraday's law and Lenz's law. Autoinduction. RL circuits.

Back

Colloids and Interfaces (QUI07212L)

Theoretical:
Preparation and properties of colloidal systems. Gas-liquid, liquid-liquid and liquid-solid interfaces. Laplace, Kelvin, Gibbs, Young and Poisson-Boltzmann Equations. Tensioactive agents (surfactants). Hydrophile-lipophile balance. Micelle directed synthesis. Monocamadas. LB films. Emulsions and foams. Emulsion polymerisation. Wetting. Detergentes. Flotation. Origin of surface charge. Electric double layer models. Experimental methods. DLVO theory. Steric stabilisation.
Practical:
Presentation; Determination of surface tension; Gibbs isotherm; Demonstration experiments; Determination of the cmc; Analysis of electrokinetic properties (4 classes); Resolution of problems (2 classes).

Back

Chemical Synthesis (QUI11974L)

Synthesis and reactivity of 1,3-dicarbonyl compounds. Synthesis of -hydroxyketones.
Protective groups: a) acetal; b) protecting groups for alcohols; c) protecting groups for amines. Retrosynthetic analysis. Disconnections. Idealized reagents: synthons. Equivalent reagents.Two-group disconnections. Multiple step synthesis. Functional group interconversion. Amine synthesis using functional group interconversion.
Synthesis and typical reactions of organometallic compounds:
a) ligand substitution; b) oxidative addition and reductive elimination; c) insertion and elimination; d) electrophilic and nucleophilic addition and abstraction. Organometallic compounds in Organic Synthesis. Manipulation of air sensitive compounds.

Back

Physical Chemistry III (QUI11975L)

Symmetry and group theory: groups, representations and characters. Tables of characters. Spectroscopy: general characteristics. Rotational spectra. Diatomics and poliatomic molecules vibrational spectra. Raman Spectroscopy. Electronic transistions. Absorption and emission spectroscopies (fluorescence, fosforescência). LASERes. Photoelectron Spectroscopy. Nuclear magnetic Resonance and electronic spin resonance: principles, techniques and applications. Statistical thermodynamics: distribution of molecular states, partions functions, fundamental relations, applications to the calculation of thermodynamic properties and chemical equilibrium.

Back

Computational Chemistry (QUI07218L)

Introduction (use of computers in science - historical perspective, architecture of a modern computer)
Linux environment
Conventional computational methods
CAS Software in Chemistry and Chemical Engineering
Visualization (graphical representation of results, design and visualization of molecules)
Quantum Chemistry (Hückel method, semi-empirical methods, ab initio methods)
Kinetics of complex reactions
Molecular Mechanics (molecular dynamics methods, Monte Carlo method)
Computer simulation of chemical processes
Unconventional computational methods (models inspired by nature and their applications, introduction to intelligent systems and their applications, introduction to visual programming environments)

Back

Scientific Training (QUI11976L)

Individual and original work, in a subject of Chemistry.
The work involves:
- Research and analysis of adequate bibliography about the subject.
- Laboratory or theoretical/computational project;
- Write a report;
- Oral presentation of a summary of the work.

Back

Biochemistry (QUI00348L)

I – Lectures Program
1) Introduction to the metabolism. Metabolic pathways and their control. Clinical correlations.
2) Carbohydrate metabolism and their control: glycolysis. gluconeogenesis; glicogenolysis and glycogenesis; pentose phosphate pathways. Piruvic acid degradation.
3)Acetil Co-A pathways. Tricarboxylic acids cycle and their regulation.
4) Electron transport chain and oxidative phosphorylation.
5)Glyoxilic acid cycle. Photosynthesis and photorespiration.
6) Lipid metabolism and their control: Beta-oxidation and bio-synthesis of fatty acids; Ketone bodies; prostaglandins, thromboxanes and leukotrienes; phospholipids; sphingolipids; cholesterol; plasma lipoproteins.
7) Aminoacid metabolism and their control. Purine and pirimidine metabolism. Iron and heme metabolism.
8) Fundamentals of genetic information and expression. Acid nucleic biosynthesis. Transcription. Proteins biosynthesis.
9) Integration of metabolism. Metabolic interrelationships and their control. Role of hormones in Biochemistry.
10) Main metabolic correlations.

II - Laboratorial works:

1- Presentation. The Objectives and avaliationof laboratorial component.
2- Research and administration of Information in Biochemistry
3- Study of phosphate compounds hidrólise
4- Electron transport in thylakoid membrane and proton gradient
5- Oxydative Phosphorilation - Part I
6- Oxydative Phosphorilation - Part II
7- Biomembrane permebilization (Study of metabolic pathways in situ)

Back

Introduction to Quality Control (QUI11977L)

1 Concepts and Definitions
1.1 General concepts. Quality and its historical evolution.
1.2 Control of the quality.
1.3 Definition of the politics of development of the quality
1.4 National system of Quality (SPQ). Main subsystems of the SPQ.
1.5 The Portuguese Institute of the Quality. Normalization, metrology and qualification.
2 Costs of the quality
2 Quality costs concerning the safety at work.
2 Costs of the non quality.
3 Quality tools
3.1 The seven basic tools of quality.
4 Sampling
4.1 Definition. Types of sampling.
4.2 Different steps for plans sampling implementation.
4.3 Plan of sampling for variable
4.4 Plans of sampling for attributes.
5 Statistics Applied to the Quality
5.1 Control charts utilization
6 Norms of Quality Management
6.1 Beddings and vocabulary - ISO 9000: 2000
6.2 System management of quality - ISO 9001: 2008
6.3 Improvement of performance - ISO 9004: 2000
6.4 Systems of security management and health - OSHAS 18001:1999.

Back

Industrial Chemistry (QUI11978L)

The chemical industry worldwide and in Portugal. The history of Chemical industry (topics). The evolution of chemical industry in some countries. Comparison with the History of Science and History of Technology. The developement of chemical industry in Portugal. Chemical Process industry. Raw materials. Products from oil, natural gas, charcoal, carbohydrates, vegetal oils and greases. Raw materials for inorganc products. Recycled materials. Energy. Types of energy. Uses of energy in chemical industry. Commodities. Industrial gases. Oil refinning. Chemical and physical processes of refinning. Petrochemical products. Olefines. Polyolefines : production and applications. Syn gas production. Carbochemical products. Acetylene. Chemicals from syn gas. Acid acetic production. Tereftalic acid and polyesthers. Pulp and paper industry. Concrete industry.

Back

Water Treatment and Wastewater (QUI11979L)

1. Introduction to the management of water supply systems.
1.1 Water supply systems.
2. Qualitative and quantitative characterization of water.
2.1 Physical parameters, chemical, microbiological and others.
2.2 Treatment of water for human consumption.
3. National and European legislation applicable.
4. Quantitative and qualitative characterization of effluents.
4.1 Loads pollutants typical in municipal wastewater
4.1.1 Organic matter and solids
4.1.2 Nitrogen and phosphorus
4.1.3 Metals
4.1.4 Pathogenic Microorganisms
4.1.5 Emerging Pollutants
5. Revision of concepts
5.1 Suspended solids, dissolved, fixed and volatile
5.2 Chemical Oxygen Demand (COD)
5.3 Biochemical Oxygen Demand (BOD)
5.4 Total Organic Carbon (TOC)
6. Broad outline of the biological treatment of an effluent
7. Treatment systems. Activated sludge processes
8. Removal of nutrients.
8.1 Nitrogen;
8.2 Phosphorous;
9. Removal of xenobiotic compounds
10. Case studies

Back

Carbon Based Materials (QUI01056L)

1: Presentation. 2: Structure. 3: Reactivity. 4: Precursors. 5: Textural Characterisation. 6: Chemical Characterisation. 7: Carbon Black. 8: Problems. 9: Activated Carbon. 10: Carbon Membranes and Molecular Sieves. 11-16: Practical. 17: Carbon Fibres and Composites. 18: Problems. 19: Carbon in Metallurgy. 20: Problems. 21: Fullerenes and Nanotubes. 22: Problems. 23: Carbon in Electrochemistry and Catalysis. 24: Problems. 25: Diamond. 26: Problems. 27: Discussion of the Practical Work. 28: Presentation of the 2nd monography.

Back

Chemistry Applied to Heritage (QUI11980L)

Introduction and background (Art and Heritage, Conservation and the Charter of Venice, Heritage Science vs Heritage and Science). Color: physical, chemical and physiological properties. Pigments: history of its use, physical and chemical properties. Binders, varnishes, consolidants and glues. Easel painting - production techniques and conservation. Mortar and stone materials - classification, pathologies and conservation. Metals - classification, corrosion and conservation. Glass and ceramics - classification, production, pathologies and conservation. Textile and dyes – classification and conservation. Documents - classification, pathologies and conservation. Photography - chemistry of photographic processes, pathologies and conservation. Techniques of physical and chemical analysis of cultural and artistic artifacts - area exames, in-situ analytical techniques, microanalysis techniques

Back

Chemistry of Materials (QUI11981L)

1: Introduction to Polymers. 2: Polymer Molecular Structure. 3: Polymerisation Mechanisms. 4: Polymer Properties. 5: Liquid Crystals. 6: Polymer Processing. 7: Elastomers and Gels. 8: Network Polymers. 9: Natural Polymers. 10: Sol-Gel Syntheses. 11: Inorganic Gels. 12: Characterisation Techniques. 13: Biomaterials. 14: Other new Materials.
+ 14 practical and problems classes.

Back

Chemistry of Natural Products (QUI01080L)

Back

Chemistry of Natural Systems (QUI11982L)

Chemistry of atmosphere – Chemical composition, structure and function; chemical reactions and photochemistry reactions; anthropogenic action and its effects; air quality.
Chemistry of water – physical and chemical properties of water; sources of water; water quality control; chemical equilibriums in natural waters; atmosphere – water – sediments interaction; water quality modelling.
Chemistry of soil – Geochemistry of surface; soil composition; plants growth and trace elements; soil pollution.

Back

Forensic Chemistry (QUI11983L)

The crime scene.
Collection and handling of evidence.
Analysis of drugs.
Analysis of traces of fuel in arson.
Analysis and processing of fingerprints.
DNA analysis.
Fiber analysis.
Analysis of firing of firearms.
Analysis of traces of paint.
Analysis of explosives.

Back

Molecular Simulation (QUI01109L)

Statistical thermodynamics: distribution of molecular states, partition functions, fundamental relationships, applications to the calculation of thermodynamic properties and chemical equilibrium.
Introduction to the molecular simulations. Periodic boundary conditions. Trajectories and properties. Ergodicity.
The Molecular Dynamics method. Simulations in the microcanonical ensemble. Simulations in the canonical ensemble: the Nosé-Hoover and the Berendsen thermostats. Simulations in the isobaric ensemble: the Berendsen and the Parrinello-Rahman barostats.
The Monte Carlo method. Canonical ensemble, isothermal-isobaric ensemble, grand canonical ensemble and Gibbs ensemble.
Analysis of simulations results. Radial distribution functions. Mechanical properties. Fluctuations. Correlation functions. Dynamical properties.

Back

Solids and Surfaces (QUI11984L)

Structure and surface texture. Surface chemical properties - type and degree of regularity of the porosity of various materials of fundamental importance as adsorbents and catalysts. Infra-red spectroscopy applied to the study of surface chemistry. Helium and Hg pycnometry. Estimation of specific surface area from particle size from TEM, SEM and XRD. Adsorption from the liquid phase. Adsorption from the gas phase. Mercury porosimetry. Immersion calorimetry. Isosteric enthalpies of adsorption.
Execution of a laboratory project, analysis of the results, developed report and respective oral presentation.

Back

Scope of Present Chemistry (QUI01062L)

Themes from different areas of chemistry of current interest and perspective of future development.

- Medicinal Chemistry.
- Green Chemistry.
- Chemistry of natural products.
- Forensic Chemistry.
- Nanomaterials.
- Polymers.
- Electrochemical.
- Catalysis

Back

Current Economic Topics (ECN11985L)

1. Macroeconomics. Microeconomics: What's economics all about?.
2. Notion of macro aggregates..
3. Macro policies: Fiscal policy, monetary and income policies, price policies
4. Stabilization and Inflation.
5. Unemployment and labour market.
6. Open economy interdepednendency: different types of balances.
7. The gorwth equation. Growth vs development: the long run perspective.
8. Development: equity vs efficiency. Wealth and distribution.
9. Competition. The role of the private sector.
10. Sate and regulation. Market vs state.
11. Political economy and institutions
12. Economics and Human rights.
13. Market and crises: 2008 crises and sovereign debt crises of 2010-12.

Back

Critical Thinking and Argumentation (FIL11986L)

Identification of questions, positions and arguments
Arguments: conclusions and reasons
Implicit premises
Intermediary conclusions
Language: vagueness and ambiguity
Kinds of definitions
Facts and values
Objective and subjective judgements
Representing arguments with diagrams
Does the conclusion follow from the premises?
Probability in the premises
Strong and weak inductions
Principles of rational discussion
Common mistakes in the assessment of premises
Appeals to authority
Mistaking the person for the argument
Disjunctive and conditional claims, and how to deny them
Necessary and sufficient conditions
Reasoning from hypothesis
Contrafactual reasoning
Objecting and refuting
Presenting and assessing counter-examples
Appeals to emotion
Fallacies: formal and with respect to content
Reasoning by analogy
Numbers: graphs and averages
Generalizing: detecting non-representative samples
Generalizing: margin of error and confidence level
Causal reasoning: causes, effects, normal conditions

Back

Entrepreneurship and Innovation (GES02310L)

Module 1 – Introduction to Entrepreneurship and Innovation
a. Definitions and concepts of Entrepreneurship
b. Profile and characteristics of entrepreneurs
c. Social entrepreneurship and intrapreneurship
d. What is innovation? Types of innovation
d. Dynamics of innovation

Module 2 – Conception and Structuring business ideas
a. Process and techniques of generating ideas
b. Design Thinking tool
c. Evaluation of business ideas
d. The process of creating a business idea and firm
e. Simulation games- from ideas to business formation