

S4 PHYSICS

- Class hours: 1h30 per week, in English.
- Equipment: 2 science rooms containing all the required equipment (sink, electrical equipment, computers) and one regular room, all with smartboards. The maximum number of students per class is 24.

- Topics:

Electricity : Includes the study of: properties of DC circuits; the Coulomb; calculations of current, voltage & resistance; build/analyze circuits; electrical safety in the home.

Magnetism : Includes the study of: field lines; magnetic field patterns of bar magnets & solenoids; the motor effect; electromagnetic induction.

Mechanics : Includes the study of: vector & scalar quantities; distinguish between constant speed, instantaneous speed, average speed & acceleration; types of forces; Newton's laws of motion.

Waves : Includes the study of: characteristics of an oscillating source; wave characteristics; amplitude, frequency, period & speed; longitudinal versus transverse waves; sound waves.

Detailed syllabus: <https://www.eursec.eu/en/European-Schools/studies/syllabuses>

S4 CHEMISTRY

- Class hours: 1h30 per week, in English
- Equipment: 2 science rooms containing all the required equipment (sink, electrical equipment, computers) and one regular room, all with smartboards. The maximum number of students per class is 24.
- Topics covered in S4:
 - Elements and atoms (historic perspective, Bohr model, isotopes, RAM)
 - Periodic table (periods, groups)
 - Chemical bonds (ionic, covalent, electronegativity and polarization)
 - Solutions (ionic and molecular)
 - Reactivity (reactions and equations, energy, heat transfers, reaction rate, catalysts)
 - Crude oil (fossil fuels, fractional distillation, hydrocarbons, isomers, pollution)
 - Plastic (polymers)

Students study the different topics by performing experiments and analyzing the results, as well as carrying out small projects.

Detailed syllabus: <https://www.eursec.eu/en/European-Schools/studies/syllabuses>

S5 PHYSICS

- Class hours: 1h30 per week, in English.

- Equipment: 2 science rooms containing all the required equipment (sink, electrical equipment, computers) and one regular room, all with smartboards. The maximum number of students per class is 24.

- Topics:

Mechanics : Includes the study of: work; gravitational potential energy; kinetic energy; conservation of energy; momentum; application of Newton's 3rd law.

Heat Energy & the Structure of Matter : Includes the study of: the kinetic theory of matter; the Kelvin scale; latent heat & changes of state; specific heat capacity.

Fundamental Particles & Forces : Includes the study of: electrons; neutrons; protons; isotopes.

Radioactive Decay : Includes the study of: activity; half-life; alpha, beta & gamma decay; reaction equations.

Nuclear Energy : Includes the study of: fusion; fission; mass as a form of energy; examples of fission reactions; nuclear power.

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S5 CHEMISTRY

- Class hours: 1h30 per week, in English
- Equipment: 2 science rooms containing all the required equipment (sink, electrical equipment, computers) and one regular room, all with smartboards. The maximum number of students per class is 24.
- Topics covered in S5:
 - Redox reactions (exchange of electrons)
 - Electrochemical cells (Galvanic cell, electrolytic cell)
 - Quantitative Chemistry (mole, molar mass, molar volume, concentration and dilution, mass-to-mass calculations)
 - Organic Chemistry (alcohols, carboxylic acids, carbohydrates, triglycerides)
 - Acids and bases in water (dissociation, acidity, environmental problem of CO₂)
 - Acid/Base reactions (neutralization, titration)

Students study the different topics by performing experiments and analyzing the results, as well as carrying out small projects.

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S6 PHYSICS

- Class hours : 3h per week
- Equipment: 2 science rooms containing all the required equipment (sink, electrical equipment, computers) and one regular room, all with smartboards. The maximum number of students per class is 24.
- Content :
 - Mechanics : Kinematics : Vector representation ; Uniform and uniformly accelerated movement ; Combination of velocities ; Projectile movement / Dynamics : Forces; Newton's laws ; The elastic force ; Dissipative force ; Universal gravitation ; Variation of g / Conservation laws : Energy ; Momentum ; Collisions / Uniform circular motion : Basics ; Centripetal force ; Satellite motion ; Frames of reference / Simple harmonic motion : Basics ; Energy exchange between oscillators
 - Electric and magnetic fields : The electric field : Basics ; Uniform electric field ; Electrical potential and potential energy ; The radial electric field / Capacitance : Basics ; The parallel plate capacitor ; Energy storage ; Time to charge and discharge a capacitor ; Capacitors in combination / The magnetic field : Basics ; The current element ; The uniform magnetic field ; The solenoid ; Moving charges in a magnetic field ; Moving charges in a magnetic field ; Electromagnetic induction

Detailed syllabus: <https://www.eursec.eu/en/European-Schools/studies/syllabuses>

S6 CHEMISTRY

- Class hours: 3 hours per week, in English
- Equipment: 2 science rooms containing all the required equipment (sink, electrical equipment, computers) and one regular room, all with smartboards. The maximum number of students per class is 24.
- Topics covered in S6:
 - Electronic structure of the atom and the periodic table (electron shells and subshells, orbital model, periodicity in the third period and trends within groups, periodicity of the chemical properties of oxides)
 - Chemical bonds (ionic, covalent, comparison of properties of covalent and ionic compounds, metallic bonds, polymorphism)
 - Intermolecular bonds (Van der Waals, dipole-to-dipole, hydrogen bonds)
 - Ideal gas law
 - Energy in Chemistry (Conservation of energy, enthalpy change, entropy change, spontaneity of a transformation)
 - Chemical kinetics and equilibria (factors affecting the rate of a reaction, collision theory and transition state theory, reversible reactions, factors influencing equilibria)
 - Organic Chemistry (alkanes, alkenes, aromatic compounds, determination of the structure of an organic substance)

Students study the different topics by performing experiments and analyzing the results, as well as carrying out small projects.

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S7 PHYSICS

- Class hours : 3h per week
- Equipment: 2 science rooms containing all the required equipment (sink, electrical equipment, computers) and one regular room, all with smartboards. The maximum number of students per class is 24.
- Content :
 - Field physics : Energy in the inverse square field : The gravitational field ; The electric field ; The electron volt / Energy in the uniform field : The uniform gravitational field ; The uniform electric field ; The magnetic field / Movement of a particle in a field : Uniform gravitational field ; Uniform electric field ; Uniform magnetic field ; Applications
 - Waves : Basics : Definitions – Sinusoidal waves ; Equation of a progressive wave ; Huyghens' principle ; Examples / Behaviour : General ; Refraction ; Reflection ; Diffraction ; Interference ; The Doppler effect
 - The dual character of matter and radiation : General / Corpuscular behaviour of light : The photoelectric effect ; Measurement of Planck's constant ; Momentum of light / Wave behaviour of particles : Diffraction of particles ; De Broglie waves ; Applications
 - Atomic physics : Generalities : the nuclear atom / Series / Eigenvalues for the hydrogen atom
 - Nuclear physics : Elementary particles / Nuclear reactions : Stable and unstable nuclei ; γ -rays ; Mass – energy equivalence ; Mass defect and binding energy ; Binding energy per nucleon ; Artificial radioactivity ; Fission and fusion ; Application of conservation laws ; Reactors / Radioactive decay : Definitions ; Exponential decay ; half-life ; Radioactive series

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S7 CHEMISTRY

- Class hours: 3 hours per week, in English
- Equipment: 2 science rooms containing all the required equipment (sink, electrical equipment, computers) and one regular room, all with smartboards. The maximum number of students per class is 24.
- Topics covered in S7:
 - Acids and bases:
 - Brønsted definition, pH measurement, relative strength, pH of aqueous solutions, acid-base titrations, behavior of ionic compounds in solution, buffer solutions)
 - Electrochemistry:
 - redox reactions, electrochemical cells and standard electrode potential
 - redox couple, redox titrations, electrolysis, cells, corrosion
 - Organic Chemistry:
 - physical and chemical properties of alcohols, aldehydes, ketones and carboxylic acids
 - carbohydrates
 - aspirin
 - optical isomerism
 - nomenclature, physical and chemical properties of fats and oils, amines and amino acids

Students study the different topics by performing experiments and analyzing the results, as well as carrying out small projects.

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LAB SCIENCE

The Lab Science is an optional cursus. It's mainly dedicated to practical scientific investigation. The topics are chosen by the teacher and are complementary to what is studied in the main cursus in Physics and Chemistry. Students either work on lab experiments or on projects.

Duration : 1h30 per week ; alternated with Biology.

Content :

S6

- **Geometrical optics** : the lenses ; producing an image ; optical instruments : refractor, telescope, microscope
- **Techniques in chemistry** : extraction (steam distillation, ...) ; cosmetics ; chemistry in cooking ; kinetics ; ...
- Other topics may be studied alternatively, astronomy for example.

S7

- **Techniques in chemistry** : titrations (conductivity, potentiometry, acid/base) ; organic synthesis (aspirin and its formulations, ...) ; ...
- **Electronics** : use of an electronic platform (Arduino®)
- Other topics may be studied alternatively, astronomy for example.

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