## 2. BIOLOGICAL AND MEDICAL SCIENCE

### Course Unit 2.1.S1: Fundamental biology

<table>
<thead>
<tr>
<th>Semester: 1</th>
<th>Competence: 4</th>
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<tbody>
<tr>
<td><strong>Lecture:</strong> 20 hours</td>
<td><strong>Tutorial:</strong> 5 hours</td>
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<tr>
<td><strong>ECTS:</strong> 1</td>
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### Prerequisites

None

### Objectives

Identify living organisms and their characteristics,
Develop an overview of the levels of organisation from the cell to the organism,
Understand the basic knowledge of cellular and molecular biology,
Understand the relation between biological knowledge and the concepts of homeostasis, illness, or therapeutics.

### Content Elements

**Molecules** constitutive of life and their function in biological balances or imbalances:
- oxygen, water, hydrogen peroxide, carbon, chlorine, sulphur, nitrogen, ammonia, nitric acid, nitrates, nitrites, phosphates, sodium, potassium, magnesium, calcium, mercury,
- trace minerals, enzymes,
- nutriments, carbohydrates, protids, proteins, lipids.

**The cell:**
- the cell cycle, cell differentiation and the notion of tissue types and cell structures, inter cellular communication, receivers and mediators
- cell life and the function of excitable cells (nervous and muscular), the action of the neuron and transmission, synapses, muscle contraction.

### Pedagogical Recommendations:

This unit provides students with a scientific basis which they will build upon in future training courses. The instructors adapt to the level of the students and encourage them to establish links between this unit and the professional situations they will encounter in their future profession.

### Assessment methods

Written knowledge evaluation.

### Assessment criteria

Accuracy of knowledge.
<table>
<thead>
<tr>
<th>Course Unit 2.2.S1: Life cycles and key functions</th>
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**Semester:** 1  
**Competence:** 4  

**Lecture:** 45 hours  
**Tutorial:** 15 hours  
**Practicum:** 15 hours  

**ECTS:** 3

**Prerequisites**
None

**Objectives**
Develop an integrated view of the functioning of the human organism to deduce the impact of certain disturbances on the internal equilibrium,
Describe the levels of organisation in the human organism and their connections,
Demonstrate how the key functions of the organism meet the biological needs of sustaining life,
Describe health throughout the cycles of life and the development of the human being,
Explore the meaning of transitions experienced by individuals during their growth and evolution.

**Content Elements**

**Concepts:** chronobiology, lifestyles, growth, metabolism, nutrient, thermogenesis, thermolysis.

**Homeostasis:**
- regulation of pH, temperature, blood sugar, serum calcium, thyroid hormones, vitamin D,
- mineral balance, liquids, ions, electrolytes, osmolarity, acid/base balance, pHmetry.

**Integrative biology and the organisation of the living organism** through endocrine, immune and nervous systems.

**The organisation of the human body:** chemical, cellular, tissue, organic and systemic.

**The key functions,** anatomical and physiological aspects: respiratory, digestive, cardiac, elimination, reproduction, motor, sensory.

**The interaction and interdependence of systems**

**The stages of life,** from birth to death, changing and evolving systems.

**The molecular basis for the organisation of the human genome**

**The essential bases of the concept of heredity**

**Genetic information** and its conservation, distinction between prokaryotes and eukaryotes,
The transmission of genetic information and the synthesis of proteins.

**Pedagogical Recommendations:**
This unit provides students with the fundamental knowledge that they will use throughout their training course. It is important to provide them with the means of finding information concerning this field which remains fairly comprehensive and will be explored in-depth during the study of the pathophysiological process.
It also ensures that the student uses a specific and adapted vocabulary to situate elements of the body and describe human functioning.
The instructors adapt to the level of the students and encourage them to establish links between this unit and the professional situations they will encounter in their future profession.

**Assessment methods**
Written knowledge evaluation.

**Assessment criteria**
Accuracy of knowledge.
# Course Unit 2.4.S1: Traumatic processes

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<thead>
<tr>
<th>Semester: 1</th>
<th>Competence: 4</th>
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<tbody>
<tr>
<td>Lecture: 30 hours</td>
<td>Tutorial: 10 hours</td>
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**ECTS:** 2

## Prerequisites

## Objectives

- Explain the notion of the pathophysiological process,
- Characterise the principles of symptomatology,
- Explore the notion of the physical traumatic process,
- Explain the occurrence of traumatic pathologies,
- Identify the signs, complications, risks, documented trauma treatments.

## Content Elements

- The traumatic process and the various types of trauma: by cause, by organ, by domain,
- The onset mechanisms of traumas,
- Traumatic shock and its consequences: contusion wound, hematoma, sprain, fracture, dislocation...
- Trauma by organ: skeleton and joints, skin lesions, head trauma, spinal trauma, chest trauma, abdominal-pelvic trauma,
- Trauma by domain: road, sports, psychological,
- Polytrauma
- Emergency traumatology.

**Pathologies or health issues studied during training are listed below, others may be added**

- Head trauma,
- Hip and femoral head fractures,
- Polytraumas,
- Fractures of a limb,
- Wounds of the abdomen,
- Amputation of a limb.

## Pedagogical Recommendations:

Anatomy and physiology are studied and related to the traumatic process.

The processes are explained in their mechanisms, their impacts, their complications, their interferences. The pathologies are processed as a whole: epidemiology, pathophysiology, symptomatology, etiology, therapeutics, complications, evolution, and always linked to the affected individuals and populations. Instruction is based on examples and practical situations and students are encouraged to research the topics discussed.

The list of pathologies considered compulsory covers the whole course; certain pathologies may be addressed in other CU’s.

The connection to prescription regulations are defined and examined in-depth in CU 2.11.S1, CU 2.11.S.3 and CU 2.11.S5 Pharmacology and therapeutics.

## Assessment methods

Written knowledge evaluation.

## Assessment criteria

Accuracy of knowledge. Accuracy in the understanding of physiopathologic mechanisms.
### Course Unit 2.10.S1: Infectiology, hygiene

<table>
<thead>
<tr>
<th>Semester: 1</th>
<th>Competence: 3</th>
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<tbody>
<tr>
<td><strong>Lecture:</strong> 20 hours</td>
<td><strong>Tutorial:</strong> 20 hours</td>
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<td><strong>ECTS:</strong> 2</td>
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#### Prerequisites

None

#### Objectives

Describe the action mechanisms of infectious agents,  
Identify the hygiene rules used in healthcare facilities and set out arguments for their use.

#### Content Elements

**Infectious agents:**  
Bacteria, viruses, fungi, parasites, unconventional transmissible agents,  
Microbial ecology,  
The action mechanisms of infectious agents on the human organism: the infectious agent-host relationship, modes of transmission, sensitivity factors, the notion of resistance.

**The overall structure of the immune system:**  
Lymphocytes and their modes of action,  
The action of the immune system, autoimmunity, allergies, immune disorders, feto-maternal compatibility.

**Care associated infections:** epidemics, iatrogenic epidemics, cost of infections, social impact…

**The rules of hygiene:** hospital hygiene, hand hygiene, professional clothing, clean and dirty circuits in care institutions.

**The means to fight against infection:**  
- Pre-disinfection, cleaning, disinfection, decontamination, sterilisation,  
- Standard precautions and additional precautions, protective isolation,  
- Hygiene protocols,  
- domestic or community working rules.

#### Pedagogical Recommendations:

This unit aims to link the scientific understanding of infectious diseases with hygiene measures in the given care. Understand the mechanisms of infection, which will be reviewed in CU 2.5.S.3 in relation to inflammatory and infectious processes, provide a structured approach to infectious transmissions and ways to overcome them. This CU is studied during the first semester to provide the student with the necessary rules of hygiene upon arrival in practical training.  
The connection to prescription regulations are defined and examined in-depth in CU 2.11.S1, CU 2.11.S.3 and CU 2.11.S5 Pharmacology and therapeutics.

#### Assessment methods

Individual written analysis of a situation encountered during practical training.

#### Assessment criteria

Identification of hygiene rules,  
Relevance of argumentation in their use.
## Course Unit 2.11.S1: Pharmacology and therapeutics

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<tbody>
<tr>
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<td><strong>Tutorial:</strong> 10 hours</td>
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<tr>
<td><strong>ECTS:</strong> 2</td>
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### Prerequisites
CU 2.1.S1 Fundamental biology.

### Objectives
Cite the action mechanisms of absorption and the elimination of medication,
Identify the notions of dosage, dilution, preparation.
Explain the risks and dangers in the administration of medication.

### Content Elements

**Pharmacology:**
The principles of chemistry relevant to pharmacology,
Pharmacokinetics, route of administration, absorption, transformation, distribution, elimination,
Pharmacodynamics, mechanisms of action, side effects, medication interactions (synergism, potentiation, antagonism)
The pharmaceutical forms, solids, liquids, galenics for parenteral use or cutaneous or transmucosal administration, forms in experimentation,
The dosages, formulations, dilutions, solvents and solutes,
The risks and dangers of the medication, the recommendations.

### Pedagogical Recommendations:
The CU is the first of a three CU cycle focused on pharmacology, it aims to provide students with the necessary bases from the outset of the first semester so that they are aware of the risks and dangers of administering medication.
The elements of this CU will be completed in CU 2.11.S2 and CU 2.11.S5.

### Assessment methods
Written knowledge evaluation.

### Assessment criteria
Accuracy of knowledge.
Understanding of the mechanisms.