

## Medical Equipment, Safety and Regulations (E092682)

**Course size** *(nominal values; actual values may depend on programme)*

**Credits 5.0** **Study time 150 h**

**Course offerings and teaching methods in academic year 2023-2024**

A (semester 2)	English	Gent	lecture
B (semester 2)	Dutch	Gent	

**Lecturers in academic year 2023-2024**

De Baerdemaeker, Luc	GE33	staff member
De Sutter, Johan	GE35	staff member
Duytschaever, Mattias	GE35	staff member
Peperstraete, Harlinde	GE38	staff member
Troisi, Roberto	GE38	staff member
Vermaelen, Karim	GE35	staff member
Eloot, Sunny	GE35	lecturer-in-charge

**Offered in the following programmes in 2023-2024**

	crdts	offering
<a href="#">Master of Science in Biomedical Engineering</a>	5	B
<a href="#">Master of Science in Biomedical Engineering</a>	5	A

**Teaching languages**

English, Dutch

**Keywords**

Technology in medicine, safety and regulations.

**Position of the course**

Interpretation in the basic sciences as used in the practice of Health Care related to the equipment.

**Contents**

**Digestive endoscopy**

Principles of light- and image transmission in endoscopy  
 Diagnostic and therapeutic applications of endoscopy in the GI tract, surgery, pneumology, orthopedics, etc...  
 Principles of cutting and coagulation in the human gut  
 Principles of cleaning and disinfection of endoscopes  
 Visit of the digestive endoscopic unit

**Ultrasound in medicine**

Introduction: a few case studies. Reflections on the nature of medical reasoning and the differences with a purely scientific and technological approach. Theoretical principles of ultrasonography and doppler. Overview of devices and other requirements for ultrasound examination. Differences between anatomical, surgical and imaging approach. Artifacts and their importance for diagnostic imaging. General and special applications in practice.

**Monitoring in anesthesia**

Aim is to have knowledge of the components and mechanisms of action of SpO2 monitoring, invasive and non-invasive pressure monitoring, monitoring of oxygen, carbon dioxide and inhaled molecules used in anesthesia. Some aspects of ECG, TEE and Swan Ganz thermodilution technique for monitoring cardiac output will be

discussed.

During a second session there will be a guided tour at the operating room where monitoring of neuromuscular transmission, monitoring depth of anesthesia and hemodynamic monitoring will be demonstrated.

### **Surgery**

Introduction to Surgery and classification of the operations

Prevention of infections

Techniques of sterilization and disinfection

Surgical instruments for open and minimally invasive operations

Principles of electrical cauterization

Energy instruments for cauterization

Cavitron ultrasonic surgical aspirator for tissue dissection

Intraoperative diagnostic devices: ultrasound; digital fluoroscopy

Robotics in the OR

### **Pneumology**

Pulmonary function: introduction to spirometry, lung volumes and diffusion measurement, with emphasis on both the technical background, as well as the impact for daily routine clinical practice.

### **Nephrology – Hemodialysis**

Equipment for hemodialysis – modalities in dialysis - monitoring

### **Diagnostic and therapeutic techniques in physical medicine and rehabilitation medicine**

Diagnostic: electrophysiology (ENMG, SEP, MEP); ultrasound, step-analysis, worksimulator

Therapeutic: shockwave; electrotherapy (analgesic / muscle stimulating / myofeedback); back revalidation; new Technologies in rehabilitation medicine (prostheses, computer and rehab, electrical wheelchair, controlled surrounding).

### **Cardiology**

Cardiac imaging in coronary and valvular pathology

Cardiac pacing and ICD

### **Pacemakers and Implantable Cardioverter defibrillators (ICD)**

Pacemakers: How to document an arrhythmia? Pacemaker battery & consumption.

Spectra of intracardiac signals. Fundamental laws of Electricity. Ohm's law in cardiology

Pacing and sensing threshold. Pacemaker sensors

Implantable Cardioverter-Defibrillator (ICD): Components of an ICD.

Antitachypacing and shocks. Devices and electromagnetic interference (EMI).

Telemonitoring

### **Intensive Care Unit**

Intra Cranial Pressure monitoring, Swan Ganz catheter, Intra Aortic Balloon pump, ECMO

Visit to the Intensive Care Unit

### **Safety and regulations**

Direct and indirect health risks to humans when using medical equipment, important physical quantities, protection measures and safety standards, laws, recommendations, standards and regulations in the Belgian and European context, standards for medical electrical devices, CE conformity marking, specific legislation for hospitals and safety of medical appliances, services for prevention and protection at the workplace, quality management systems in the medical practice, risk management in the engineering practice

### **Initial competences**

Knowledge on human anatomy, biology, physiology, medical physics, electrical circuits and electronics at the level of BSc in Biomedical Engineering

**Final competences**

The technique, the function and the application (the indication) of the medical devices in a hospital, aspects of safety and regulations.

**Conditions for credit contract**

Access to this course unit via a credit contract is determined after successful competences assessment

**Conditions for exam contract**

This course unit cannot be taken via an exam contract

**Teaching methods**

Lecture

**Learning materials and price**

syllabus, articles, hands-on, visits

**References****Course content-related study coaching**

On demand of the student.

**Assessment moments**

end-of-term assessment

**Examination methods in case of periodic assessment during the first examination period**

Written assessment with multiple-choice questions, Written assessment with open-ended questions

**Examination methods in case of periodic assessment during the second examination period**

Written assessment with multiple-choice questions, Written assessment with open-ended questions

**Examination methods in case of permanent assessment****Possibilities of retake in case of permanent assessment**

not applicable

**Extra information on the examination methods**

During examination period: written closed-book exam.

**Calculation of the examination mark**