

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
Master of Science in Biomedical Engineering	5	B
Master of Science in Biomedical Engineering	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, work simulator

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