

5.0 credits	30.0 h + 30.0 h	2q
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Teacher(s) :	Ronsse Renaud ; Lefèvre Philippe ; Jacquet Luc-Marie ;
Language :	Français
Place of the course	Louvain-la-Neuve
Main themes :	<p>Main themes</p> <p>This course is an introduction to the medical treatments that resort to the substitution of artificial systems to failing organs or physiological systems. For each application, the course will approach the basic anatomy and physiology notions of organs to replace, as well as an overview of failure reasons (pathology notions). Afterwards, the course will present the artificial organs (composition, functioning mode, organism adaptation) along with the therapeutic effects and the limitations to such substitution (side effects and complications). The different applications are grouped according to 3 major themes which are: vital organ substitution, passive implants and active implants.</p> <p>Vital organ substitution includes applications concerning circulation, the cardiac pump and the lungs among which the heart-lung machine, the extracorporeal oxygenation circuit, the artificial heart and the respiratory devices, especially in the context of reanimation. The artificial kidney, which deserves a deep study as an example of an artificial organ, will be particularly developed, making use of several notions of biomedical engineering (course on biomaterials, mathematical modelling, mechanics) and because of the clinical importance of kidney dialysis. The most recent developments concerning liver or pancreas will also be examined. The second domain concerns mainly passive prostheses with, as a major example, the hip prosthesis. This part of the course concerns more particularly some aspects of biomaterials with notions of biocompatibility and, above all, the biomechanics issues. It is for this last reason that external orthopedic prostheses are part of this section. Moreover, the course will examine machine organs in medical applications (pumps, actuators, transmission and tightness organs, micro-mechanisms )</p> <p>The third domain concerns primarily active implants. Prostheses and external sensorial devices will be presented as a complement to physiology reminders. But the course will insist on active implants. A general introduction will be dedicated to electrodes as an interface between biological tissues and electronic systems. The cardiac pacemaker and defibrillators will be studied exhaustively. The course will also approach sensorial pathology, cochlear implants and visual prosthesis. Motor prostheses (phrenic nerve stimulation, drop foot, muscular modification), antalgic stimulation, vagal nerve stimulation, phrenic nerve stimulation and deep brain stimulation will be also part of the course.</p> <p>Drug pumps and drug delivery systems will be approached in this section.</p>
Aims :	<p>Aims</p> <p>1. Aims</p> <ul style="list-style-type: none"> <li>- to understand the basic notions of physiology and anatomy required to design artificial organs.</li> <li>- to understand the reasons for natural organs failures (pathologies).</li> <li>- to understand the notion of vital organs substitution.</li> <li>- to be able to appreciate the difference between active implants and passive implants, as well as their characterizing properties.</li> </ul> <p><i>The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".</i></p>
Content :	<p>Content and methods</p> <ul style="list-style-type: none"> <li>- Introduction to basic notions of physiology and anatomy</li> <li>- Composition, functioning mode and adaptation of the organism to artificial organs</li> <li>- Vital organ substitution</li> <li>- Passive prostheses</li> </ul> <p>Method : theoretical course and practical work</p>
Other infos :	N / A
Cycle and year of study :	<ul style="list-style-type: none"> <li>&gt; <a href="#">Master [120] in Electro-mechanical Engineering</a></li> <li>&gt; <a href="#">Master [120] in Mechanical Engineering</a></li> <li>&gt; <a href="#">Master [120] in Biomedical Engineering</a></li> <li>&gt; <a href="#">Master [120] in Chemical and Materials Engineering</a></li> <li>&gt; <a href="#">Master [120] in Computer Science and Engineering</a></li> <li>&gt; <a href="#">Master [120] in Electrical Engineering</a></li> <li>&gt; <a href="#">Master [120] in Mathematical Engineering</a></li> </ul>

Faculty or entity in charge:	GBIO
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