

4.0 credits	45.0 h + 15.0 h	2q
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Teacher(s) :	Mahillon Jacques ;
Language :	Français
Place of the course	Louvain-la-Neuve
Inline resources:	iCampus
Prerequisites :	General biology, introduction to biochemistry and introduction to genetics
Main themes :	<p>In order to achieve the objectives of this course, the following themes will be developed, in an integrated manner:</p> <ul style="list-style-type: none"> <li>- The microbial world in the reality of its size and diversity, the multiplicity of its habitats and relationships with the environment, including the other organisms.</li> <li>- The world of viruses and bacteriophages and the methods developed for their use or control.</li> <li>- The potential of genetic adaptation of microbes and, in particular, the specificity of their sexuality.</li> <li>- The strategies allowing the most efficient control of micro-organisms, using either prophylactic or curative methods.</li> <li>- The industrial use of microbes in the fields of agro-food industry, environment or medicine.</li> <li>- The past, present and future use of micro-organisms in biological engineering.</li> </ul> <p>The main objectives of the practical work, mostly performed by the students themselves, are: i) macroscopic and microscopic observations of bacteria, fungi and bacteriophages, and ii) the use of the basic techniques of descriptive microbiology.</p>
Aims :	<p>a. Contribution of this activity to the L.O. 1.1; 2.1; 3.7, 3.8; 4.2; 6.2; 7.1</p> <p>b. Specific formulation of L.O. for this activity, in the program At the end of this activity, the student is able to:</p> <ol style="list-style-type: none"> <li>1. Identify, describe, and discriminate the main groups of micro-organisms and more specifically viruses, bacteria and archaea, including their diversity and taxonomy.</li> <li>2. Identify, describe, and discriminate the main modes of growth, development and metabolism of bacteria and archaea, in the diversity of their environments.</li> <li>3. Recognize the main human and animal diseases: causative agents, entry, vectors and pathogenesis, and discriminate the notions of pathogenic versus opportunistic micro-organisms.</li> <li>4. Differentiate the distinct modes of genomic rearrangements and genetic transfers in bacteria and viruses.</li> <li>5. Illustrate the basic notions of genetic engineering through practical applications.</li> <li>6. Describe and explain the different methods for the prevention and/or the elimination/control of pathogens and opportunists, including the methods of sterilisation, disinfection, vaccination and the use of antibiotics.</li> <li>7. Apply the basic operations and manipulations, under laboratory conditions, for the study and control of micro-organisms (bacteriophages, bacteria, archaea et fungi), including the notions of sterility and the techniques to reveal the presence of microbes.</li> <li>8. Conceive and formulate, in the scope of the Microstories, a communication for a broad audience on the numerous aspects of Microbiology.</li> <li>9. Formulate and assess, through appropriate illustrations, the impact of microbes in food and industrial microbiology.</li> </ol> <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>
Evaluation methods :	<ul style="list-style-type: none"> <li>- Oral exam (with a written preparation) containing three parts:                         <ul style="list-style-type: none"> <li>&amp; t; A theoretical development of a specific section of the course,</li> <li>&amp; t; An development requiring the integration of different parts of the course,</li> <li>&amp; t; A series of definitions/concepts calling for short answers.</li> </ul> </li> <li>- Evaluation of the report of the practical work performed by the student and feedback to the students before their written exam.</li> <li>- Evaluation of the presentation made by certain students (on a voluntary basis) that have presented a Microstory (see above), on a subject related to the course and chosen in interaction with the teacher. This evaluation replaces part of the question dealing with the definitions/concepts.</li> </ul>

<b>Teaching methods :</b>	<ul style="list-style-type: none"> <li>- The main activity is given as ex cathedra courses, which include many practical examples and case studies, taken from human and animal health, the environment or biotechnological applications.</li> <li>- At the beginning of each lecture, a recapitulation (ca. 10 min) of the main messages from the previous course is given in English.</li> <li>- On a voluntary basis, a dozen students have the possibility to present, at the end of each course, a « Microstory » (ca. 10 min), dealing with aspects related to the course.</li> <li>- Practical work (mandatory activity):                         <ul style="list-style-type: none"> <li>&amp; t; Groups of 2 students,</li> <li>&amp; t; Case study under the supervision of an assistant/technician team,</li> <li>&amp; t; Each student has the opportunity to perform the main basic operations related to the observation and control of the micro-organisms,</li> <li>&amp; t; Writing of an individual report, in the laboratory notebook.</li> </ul> </li> </ul>
<b>Content :</b>	<p>This course includes a series of theoretical lectures and a practical work where the students get acquainted with the basic techniques used in microbiology. This course contains eleven distinct parts. However, at several occasions during the lectures, connections and links are made between the different sections in order to give a comprehensive and coherent overview of the matter. The first part gives an historical account of microbiology including the various tools and approaches used in this field. Parts two and three deal with the notions of bacterial growth, nutrition and metabolism. In the fourth part, the concepts associated with bacterial genetics are detailed, in particular the phenomena of genetic rearrangements and transfers. This part is continued in the fifth section where a description of the main discoveries and corresponding techniques of genetic engineering are detailed. Prokaryotic and eukaryotic viruses are described in part six. The diversity of the bacterial world is explained in part seven. Parts eight and nine focus on microbial commensalism and symbiosis while part ten is dedicated to bacterial opportunism and pathogenicity, including the prophylactic and curative methods applied to these pathogens. Finally, part eleven gives an overview on the fields of food and industrial microbiology.</p>
<b>Bibliography :</b>	<ul style="list-style-type: none"> <li>- Mandatory support: the course does not require any specific and mandatory support.</li> <li>- Facultative information:                         <ul style="list-style-type: none"> <li>« PowerPoint » files containing the illustrations displayed during the ex-cathedra, course, available as printed version at the DUC (<a href="http://www.ciaco.com/duc.html">http://www.ciaco.com/duc.html</a>), including the laboratory booklet of the practical exercises, and as a pdf files on iCampus.</li> <li>Wiley, J., Sherwood, L., &amp; mp; Woolverton C. (2008) Prescott/Harley/Klein's Microbiology (7th Edition) WCB McGraw-Hill Publishers - 1,216 pp. - ISBN-13 9780073302089.</li> <li>Madigan, M., Brock, T., Martinko, J.M., Dunlap, P. &amp; mp; Clark, D.P. (2008) Brock Biology of Microorganisms (12th Edition) Benjamin-Cummings Publishing Company Hardback - 1,136 pp - ISBN 0132324601.</li> </ul> </li> </ul>
<b>Cycle and year of study :</b>	<ul style="list-style-type: none"> <li>&gt; <a href="#">Bachelor in Bioengineering</a></li> <li>&gt; <a href="#">Bachelor in Information and Communication</a></li> <li>&gt; <a href="#">Bachelor in Philosophy</a></li> <li>&gt; <a href="#">Bachelor in Pharmacy</a></li> <li>&gt; <a href="#">Bachelor in Computer Science</a></li> <li>&gt; <a href="#">Bachelor in Economics and Management</a></li> <li>&gt; <a href="#">Bachelor in Motor skills : General</a></li> <li>&gt; <a href="#">Bachelor in Human and Social Sciences</a></li> <li>&gt; <a href="#">Bachelor in Sociology and Anthropology</a></li> <li>&gt; <a href="#">Bachelor in Political Sciences: General</a></li> <li>&gt; <a href="#">Bachelor in History of Art and Archaeology : General</a></li> <li>&gt; <a href="#">Bachelor in Mathematics</a></li> <li>&gt; <a href="#">Bachelor in History</a></li> <li>&gt; <a href="#">Bachelor in Biomedicine</a></li> <li>&gt; <a href="#">Bachelor in religious studies</a></li> <li>&gt; <a href="#">Master [120] in Biomedical Engineering</a></li> </ul>
<b>Faculty or entity in charge:</b>	AGRO