

<p align="center">Programme of “PROCESSI BIOLOGICI INDUSTRIALI” “INDUSTRIAL BIOPROCESSES”</p>		
<p align="center">NUMBER OF ECTS CREDITS: 9 (WORKLOAD IS 225 HOURS; 1 CREDIT = 25 HOURS)</p>		
<p>• I0311; compulsory • 2nd cycle in Chemical Engineering, 2nd year:, 1st semester</p>		
<p>Teacher: MARIA CANTARELLA (Full professor of Fundamental bioprocess engineering) maria.cantarella@univaq.it</p>		
1	Course objectives and Learning outcomes	<p>The course has the objective of forming chemical engineering students with the fundamental knowledge of the main industrial bioprocesses, prevalently used in the food and pharmaceutical industries and in the environmental protection. At the end of this module the students will be able to analyze and understand the basic bioprocess limits and suggest process solution and innovation in the fine chemical industry where the production of compounds of high and constant quality with processes energetically advantageous and eco-friendly are required.</p>
2	Course content and Learning outcomes (Dublin descriptors)	<p>The knowledge of the main industrial bioprocesses is based on the study of the following topics: Raw materials and pretreatment, microorganism metabolic pathways, microorganism culture, contamination, sterilization of the fermenter feed, ethanol fermentation and distillation with a critical discussion of the industrial process choices, protein purification strategy and techniques, bioprocesses for environmental protection, for each study case the applied kinetic mathematical models and possible innovative solutions are discussed. The students will acquire</p> <ul style="list-style-type: none"> • knowledge on the basic concepts of bioprocesses and understanding through examples and discussions, • capacity to apply knowledge and understanding using the mathematical models discussed in each study case to evaluate process parameters, • skills for informed judgments and choices , • capacity to explain different bioprocesses, by following a suitable scheme underlining the importance of the appropriate form of communication, • capacity to understand the innovative solutions based on recent research results and identify the need of lifelong learning to overcome process limits. <p>On successful completion of this module, the student should</p> <ul style="list-style-type: none"> • have profound knowledge and understanding of biological pathways, micro-organism metabolism, enzymatic catalysis, bioreactors, fermentation technology • demonstrate skills in fermentation kinetics and ability to perform laboratory test for kinetic parameter evaluation, • demonstrate capacity to work with a multidisciplinary team and to respect diversity, • be able to make autonomous choices and judgments through the discussion of the process flow-sheets and the comparison of the different adopted solutions, • capacity to assess his work and adjust the methodology.
3	Prerequisites and learning activities	The student must know the fundamentals of biochemical engineering.
4	Teaching methods and language	<p>Lectures, laboratory experiments, computer modelling, home work. Language: Italian or English Ref. Text books “Biochemical engineering fundamentals” J. Bailey & D. F. Ollis, Mc Graw Hill; “Comprehensive Biotechnology” Murray Moo-young Ed; “Bioprocess Engineering “ M.L. Shuler & F. Kargi.</p>
5	Assessment methods and criteria	Oral exam