Curriculum - Academic Year 2018-19
Characteristics of the Course Units

Name	*Bioprocess*
ECTS credits	*2*
Year / Semester	*II/ 2°*
Specific learning outcomes	On successful completion of this module students should be able to: 1 – Integrate Concepts and knowledge from various domains (biology, process engineering, (bio)chemistry). 2 – Discuss the disadvantages and characteristics of the different types of bioreactors as well as their mode of operation. 3 – Dimension unit operations 4– Interpret data or observations from case studies 5–Choose an appropriate fermentation or purification strategy 6–Predict the outcome or the performance of a unit operation or specific equipment 7–Solve calculation problems
Contents	Basic function of a bioreactor, different types of bioreactors, agitation and oxygen transfer, oxygen requirements, yield coefficients, growth kinetics, enzyme kinetics, inhibition of enzyme reaction, Monod kinetics, Michaelis Menten kinetic, Design of bioprocesses, substrate inhibition, feed strategies, product formation, Analytical monitoring and control of bioprocesses, chemostat, nutrient limitation, wash-out, downstream processing, Liquid / solid separations and cell lysis, Liquid / liquid extraction and precipitation, scale-up.
Teaching and learning methods	Face to face, 45 hours The course will be held under the form of lectures also featuring the treatment of examples and solving exercises
Teaching techniques	Lectures, 45 hours
Assessment methods	Written Two mid-term written tests and a final-term written test are foreseen. The two mid-term written tests will be devoted to the assessment of the level of achievement of LOs 2 to 5 (ability of students to solve numerical problems related to designing fermenter). The final term written test will be devoted to the assessment of the level of achievement of LOs 2, 3 and, mainly, 4, 5, 6 and 7.
Assessment criteria	In the mid-term test students should demonstrate their ability to evaluate the kinetics and inhibition parameters, to identify the inhibition type To calculate the oxygen –Absorption Rate by different methods (sodium sulfite oxidation method, Dynamic Gassing out technique, Dynamic technique). - The assessment will regard their capacity to correctly identify the fermentation's mode, to formulate the adequate rate equation, to calculate the volume of the bioreactor. In the final term test students will be required to solve exercises and problem related to the fermenter design. Calculate the $K_L.a$ with correlation, the power consumption. The assessment will regard students' capacity to properly scale-up bioreactors and choose the appropriate criteria of scale-up. Finally, students' ability to participate in class discussions with teachers and colleagues will be assessed in practical classes.
Assessment metrics	Attribution of a final grade
Criteria of attribution	The grade goes from 1 (minimum) up to 20 (maximum). The minimum threshold to

of the final grade	pass is 7. To pass the exam students should obtain the minimum evaluation in all the assessments. The final grade will be determined according to the following rules: - Term written tests: 30% - Final term written exam: 70%
Preparatory course units	N.A.
Didactic material	R. Dutta, Fundamentals of Biochemical Engineering, Springer, Ane books India,2008.