



Hashemite University	 	Bio-Reactors
Faculty of Science		3 Credit Hours
Department of Biology and Biotechnology		Pre-requisite: Biotechnology Second Semester 2018/2019
Course Syllabus		

Course Information		
Course Title	Bio-Reactors	
Course Number	0104424	
Course Credits	3 (2 credits theory + 1.5 credits of practical work)	
Course Time		
Course Duration		
Prerequisite(s)		
Instructor	Dr. Muhannad I. Massadeh	
Office Location	Department of Biological Sciences and Biotechnology	
Office Phone	5047	
Office Hours		
E- mail	massadeh@hu.edu.jo	
Course Web Site:		
Text Book		
Title	Bioreactors for Tissue Engineering Principles, Design and Operation	
Author(s)	Chaudhuri, Julian.	
Publisher	Springer, Dordrecht	
Year	2005	
Edition		
References(s)	(2)- Solid-state fermentation bioreactors : fundamentals of design and operation. Springer, Berlin : 2006 (3)- Smith, J.E. (2004). <i>Biotechnology</i> . Cambridge University Press. UK.	
Evaluation Policy		
Assessment Type	Expected Date	Weight
First Exam		15%
Second Exam		15%
Other	LAB work + reports + Mid + final	5+5+10+ 10% respectively
Final Exam		40%

Course Objectives	
<ul style="list-style-type: none"> - Classify bioreactor types - Explain the major differences among various bioreactor types and recognize the constraints of bioreactors. - Learn the different types of cultivations. - Be able to choose the right bioreactor configuration for a given cell culture conditions. - Explain the effects of manipulated variables (e.g. agitation rate, aeration rate etc) on cell growth and product formation 	

Teaching and Learning Methods	
<ul style="list-style-type: none"> - Transparencies with head projector - Data show 	

Course Contents		
Week	Topics	Ch. no.
1-	<ul style="list-style-type: none"> - Bioreactors in Biotechnology - Bioprocess Development 	1
2-	<ul style="list-style-type: none"> - Cultivation Techniques: Submerged and Solid State cultivations - Basic concepts of bioreactor design 	2
3-	<ul style="list-style-type: none"> - Selection of the bioreactor - Bioreactor design and operation: Upstream Processing 	4
4-	<ul style="list-style-type: none"> - Bioreactor design and operation: Upstream Processing - Instrumentation and Control 	5
5-	<ul style="list-style-type: none"> - Instrumentation and Control - Bioreactor preparation and use 	6
6-	<u>Lecture Exam I</u>	
7-	<ul style="list-style-type: none"> - Aeration and Agitation 	8
8-	<ul style="list-style-type: none"> - Heat Transfer Phenomena - Mass Transfer Phenomena 	
9-	<ul style="list-style-type: none"> - Surface Bioreactors and their Characterization 	
10-	<ul style="list-style-type: none"> - Downstream processing: Separation, Disintegration of cells, Extraction Methods, Purification and Drying. 	
11-	<u>Lecture Exam II</u>	
12-	Translation of Laboratory, Pilot, and Plant Scale Data	
13-	<ul style="list-style-type: none"> - Applications of bioprocesses (SmF & SSF). - Bioreactors in Industry: Present state of the Art, Trends of Further Development, Practical advice on the choice of bioreactors. 	
14-	<ul style="list-style-type: none"> - Case Study 	
15-	<u>Final Exam</u>	