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

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). ***Biotechnology***. 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

- 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

- Transparencies with head projector
- Data show

Course Contents

Week	Topics	Ch. no.
1-	- Bioreactors in Biotechnology - Bioprocess Development	1
2-	- Cultivation Techniques: Submerged and Solid State cultivations Basic concepts of bioreactor design	2
3-	- Selection of the bioreactor - Bioreactor design and operation: Upstream Processing	4
4-	- Bioreactor design and operation: Upstream Processing - Instrumentation and Control	5
5-	- Instrumentation and Control - Bioreactor preparation and use	6
6-	**Lecture Exam I**	
7-	- Aeration and Agitation	8
8-	- Heat Transfer Phenomena - Mass Transfer Phenomena	
9-	- Surface Bioreactors and their Characterization	
10-	- Downstream processing: Separation, Disintegration of cells, Extraction Methods, Purification and Drying.	
11-	**Lecture Exam II**	
12-	Translation of Laboratory, Pilot, and Plant Scale Data	
13-	- 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-	- **Case Study**	
15-	**Final Exam**	