Course Specifications

Course Title:	**Tissue Culture**
Course Code:	**4014212-3**
Program:	**BSc Biology**
Department:	**Biology Department**
College:	**Applied science**
Institution:	**Umm Al-Qura university**

Table of Contents

A. Course Identification

1. Credit hours:
2. Course type **a.** University ☐ College ☐ Department ■ Others ☐ **b.** Required ■ Elective ☐
3. Level/year at which this course is offered: **4thYear / Level 8**
4. Pre-requisites for this course (if any)**:** **Genetics I (4013281-3)**
5. Co-requisites for this course (if any)**:**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**		70 %
2	**Blended**		
3	**E-learning**		10 %
4	**Correspondence**		10 %
5	**Other**		10 %

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	**28**
2	**Laboratory/Studio**	**42**
3	**Tutorial**	**6**
4	Practical/Field work/Internship	**6**
4	**Others** (specify)	**10**
	Total	**92**
Other Learning Hours*		
1	**Study**	
2	**Assignments**	
3	**Library**	
4	**Projects/Research Essays/Theses**	
5	**Others** (specify)	
	Total	

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

The course will cover many topics based on the concept of potency (the genetic potential of plants to reproduce into an entire organism). It deals with the mass production of plants, under aseptic environment in in-vitro conditions. The success of modern Plant Biotechnology is attributed to this technique, which plays an important role in micro-propagation of microbial-free plants ancd regeneration of endangered species as well as species difficult to regenerate with the traditional ways.

2. Course Main Objective

After completing this course student should be able to:

- Define the basic concepts of Plant Tissue Culture "PTC" as a Biotechnology tool.
- Recognize the importance of Plant Tissue Culture technique.
- Practice the different techniques used in Plant Tissue Culture.
- Acquire all skills used in Plant Tissue Culture techniques.
- List of chemicals, media and equipment required for Plant Tissue Culture Lab.
- Explain and analyse the role of plant growth regulators in PTC technique.
- Describe how to regenerate plants using the different techniques of PTC
- Recognize the possible reasons for failure of a specific plant tissue or organ culture.

Analyse and interpret the in vitro data and draw sensible conclusions from such data

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge:**	
1.1	Upon successful completion of this course the student will be able to: • List the various components of plant tissue culture media, e.g. minerals, growth factors, hormones, and what governs the choice of components.	
1.2	• Recognize the various steps taken to establish and optimize media for particular purposes in particular species.	
1.3	Define the various stages of micro-propagation, including morphogenesis	
1.4	Describe the types of in vitro culture. State and write a protocol to establish an unknown species and test its response	
2	**Skills :**	
2.1	- Acquire the skills needed for sub-culturing in a pathogen free environment.	
2.2	- Carry out careful examination of the cultured cells under sterile conditions.	
2.3	- Analyse the data obtained and draw careful observations and conclusions.	
2.4	- Description of the psychomotor skills to be developed and the level of performance required	
2.5	- Collecting samples from environment	
2.6	- Examining samples in lab	

CLOs		Aligned PLOs
3	**Competence:**	
3.1	Developing oral presentations	
3.2	Communicating personal ideas and thoughts	
3.3	Work independently and as part of a team to finish some assignments	
3.4	Communicate results of work to others	

C. Course Content

No	List of Topics	Contact Hours
1	**Introduction to the course** - Course syllabus and grading. - History of tissue culture. - Characteristics and importance of tissue culture	2
2	**Design& creation of the tissue culture Lab :** - Materials, instruments, glasses, distilled water & media. - Sterilization of nutritive media. - Creation of culture & growth rooms	2
3	**Factors affecting plant tissue culture** - The nature & structure of media, used explant, light, temperature, gas phase, and subculture & genotype structures.	4
4	The culture of plant organs Isolated root culture, meristem & shoot apex culture, immature flower culture, and embryo culture.	4
5	**Med term Exam**	2
6	Plant tissue culture and callus - Callus initiation, preparing explants & stock solution, culture techniques (solid & liquid media), formation of callus tissue & the developmental phases of callus, subculture & morphology of callus, uses of callus tissue..	2
7	Cell-suspension culture - Methods and phases – morphology & uses of cellsuspension culture.	2
7	Development of organs (organogenesis) - Types of organogenesis (regeneration of roots & shoots or leafy buds).	2
8	Isolation and culture of plant protoplast - Types of isolation – determination of protoplast - Viability – protoplast morphology – culture of isolated chloroplast – cell wall regeneration by cultured protoplast – uses of protoplast – protoplast fusion.	2
9	**● Introduction to plant tissue culture (definition, types of techniques and importance)**	**2**
12	**Revision**	**2**
13	**Final exam**	**2**
	Total	**28**

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge**		
1.1	Upon successful completion of this course the student will be able to: List the various components of plant tissue culture media, e.g. minerals, growth factors, hormones, and what governs the choice of components.	Discussion. -Tutorials that review the content of each lecture. - Independent study assignment which requires the use of library reference materials. -Virtual labs.	Homework, exams and research papers
1.2	Recognize the various steps taken to establish and optimize media for particular purposes in particular species.		
1.3	Define the various stages of micro-propagation, including morphogenesis		
1.4	Describe the types of in vitro culture. □ State and write a protocol to establish an unknown species and test its response		
2.0	**Skills**		
2.1	Acquire the skills needed for sub-culturing in a pathogen free environment.	- Lectures. -Brain storming. - Discussion. Follow up students the students in lab and during carryout all the laboratory experiments	- Problem solving questions. Group and individual assignments that require the application of analytical tools Giving additional marks for the students they have accurate laboratory results and good seminar presentation -Practical exam.
2.2	Carry out careful examination of the cultured cells under sterile conditions.		
2.3	Analyse the data obtained and draw careful observations and conclusions.		
2.4	Description of the psychomotor skills to be developed and the level of performance required		
2.5	Collecting samples from environment		
2.6	Examining samples in lab		
3.0	**Competence**		
3.1	Developing oral presentations	Oral presentations. □ Internet search assignments and essays. □ Incorporating the use and utilization of computer in the course requirements. □ Students will be asked for delivering a summary regarding certain topics related to the course.	Evaluation of student essays and assignments. □ Evaluating the laboratory written reports. □ Marks given to for good reports and presentations
3.2	Communicating personal ideas and thoughts		
3.3	Work independently and as part of a team to finish some assignments		
3.4	Communicate results of work to others		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Home works, search or presentation	4th and 8th weeks	10 %
2	Midterm "Written Test (1)"	8th week	30%
3	Final Exam "Practical Test"	15th week	20%
4	Final Exam Written Test		40%
5			
6			
7			
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	-Handbook of Plant Cell Culture Techniques and breeding. Ed. Evans, Sharp, Ammirato and Yamada. Macmillan, New York, 1983. -Plant Tissue Culture : Methods and Application in Agriculture. Ed. Travor A. Thorpe. Academic Press, 1981. -Growth and Organization in Plant , Stewart, F.C. Adison - Wesley Co. Reading Wareing (1987). -Plant Propagation by tissue culture: Handbook and directory of commercial laboratories. Ed. George, E. F. and Sherrington, P. D. Exegetics Limited, 1984. 2
Essential References Materials	
Electronic Materials	
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) • Class rooms are already provided with data show

Item	Resources
	• Laboratory necessity • Reduce the number of students in class rooms • Find a solution for the air conditioning problem Necessity of a library
Technology Resources (AV, data show, Smart Board, software, etc.)	data show, Smart Board
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Laboratory instruments & equipment: Spectrophotometer

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	