



# Course Specification

(Bachelor)

Course Title: Pharmaceutical Biotechnology

Course Code: PHGN 423

Program: Pharmaceutical Sciences

Department: Pharmacognosy

College: Pharmacy

Institution: Najran University

Version: 4

Last Revision Date: 18-08-2024



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## A. General information about the course:

### 1. Course Identification

1. Credit hours: (3h (2+1) )

#### 2. Course type

A. ☐ University ☐ College ☐ Department ☐ Track ☒ Program  
B. ☒ Required ☐ Elective

3. Level/year at which this course is offered: (7<sup>th</sup> / 4<sup>th</sup>)

#### 4. Course general Description:

The course will cover the concepts, techniques, and applications of the of plant cell and tissue culture. Animal cell cultures and their application. Study of the protein structures and the technologies used to enhance their stability, purity, and structure determination. The concept of gene expression. The stem cell technology and applications. DNA, and the analysis of genetic materials using PCR and electrophoresis. The gene therapy and the production of transgenic and knock-out animals, monoclonal antibodies, and recombinant DNA technology. Type and method of production of vaccines. The employment of different biotechnology procedures in drug production and solve human health problems

#### 5. Pre-requirements for this course (if any):

PHGN-322

#### 6. Co-requisites for this course (if any):

None

#### 7. Course Main Objective(s):

1. Illustrate the fundamental knowledge about plant tissue culture, biotransformation, and genetic engineering
2. Illustrate the fundamental knowledge about animal tissue culture, and stem cell technology and application
3. Illustrate the principles of protein synthesis, methods of protein separation and purification, and gene expression
4. Illustrate the principles and applications of vaccine, monoclonal antibody,





recombinant DNA technology.

5. Illustrate the principles and techniques of gel electrophoresis, PCR and ELISA.

Analyze and interpret experimental results.

## 2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	E-learning		
3	Hybrid <ul style="list-style-type: none"> <li>Traditional classroom</li> <li>E-learning</li> </ul>		
4	Distance learning		

## 3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30
2.	Laboratory/Studio	30
3.	Field	--
4.	Tutorial	--
5.	Others (specify)	--
Total		60

## B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Recognize the concepts, principles, techniques, and applications used in the pharmaceutical biotechnology including plant cell culture, animal cell culture and all topics mentioned above.	K1	Lectures	Written exams Assignments
2.0	Skills			
2.1	Integrate cell biology and genetic information to produce	S4	Lectures	Written exams Assignments





Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
	pharmaceutically active compounds, biomolecules, and genetic fragments for solving human health problem			
2.2	Prepare plant culture medium and use them for induction of plant tissue culture	S4	Laboratory work	Presentation Practical Exam Report
2.3	Interpret results from gel electrophoresis, PCR, and ELIZA experiments	S4	Lectures Laboratory work	Written exams Practical Exam Report
3.0	Values, autonomy, and responsibility			
3.1	Use properly and confidently the tools and equipments in the biotechnology laboratory following ethics and rules of biotechnology lab. and its safety procedures.	V1	Practice sessions	Practical Exam Observation card

### C. Course Content

No	List of Topics (Theoretical)	Contact Hours
1.	<ul style="list-style-type: none"> <li>- Definition, scope and importance of different types of biotechnology</li> <li>- Basic principles and terminology of Plant Tissue Culture</li> <li>- Requirements of plant cell culture lab.</li> <li>- Types of plant tissue culture media components</li> <li>- Definition and types of plant Cell and tissue</li> <li>- Factors affecting plant tissue culture Application of Plant cell and tissue culture</li> </ul>	8
2.	<ul style="list-style-type: none"> <li>- Protein structure, and protein abnormalities and caused disease</li> <li>- Protein purification, and protein applications</li> <li>- Animal- cell culture techniques, Scale-up of animal cell culture, and Applications of animal cell culture</li> <li>- Gene expression concepts and importance</li> </ul>	8
3.	<ul style="list-style-type: none"> <li>- Stem- cell technology and application</li> <li>- Basic approach to gene therapy, Disease targets for gene therapy, gene therapy (Viral vectors and non-viral vectors)</li> </ul>	6
4.	<ul style="list-style-type: none"> <li>- Monoclonal antibodies principles and applications</li> </ul>	4





	- Recombinant DNA technology concepts and applications	
5.	- Polymerase Chain Reaction (PCR) - Electrophoresis - Vaccine technology, types of vaccines and application	4
		30
No	List of Topics (Practical)	Contact Hours
1	Biotechnology laboratory principles and Safety	2
2	Introduction to apparatus and techniques in Pharmaceutical Biotechnology	2
3	Facilities and equipment of plant tissue culture medium	2
4	Preparation and sterilization of Plant Culture media	2
5	Preparation and sterilization plant explant	2
6	Induction of plant growth	2
7	Tools used for protein purification	2
8	Introduction to animal cell culture principles, and Safety	2
9	Apparatus and techniques in animal cell culture	2
10	Components of animal culture media Scale up animal culture media	2
11	Isolation of DNA	2
12	Polymerase Chain Reaction (PCR)	2
13	Gel Electrophoresis	2
14	ELISA	2
15	Practical exam in week #15	2
		30

#### D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
	Quizzes	3-14	10
	Midterm exam	7-9	20
	Assignments	15	5
	Oral presentation	12 <sup>th</sup> week	5
	Observation card	1-15	5
	Practical Handbook (report)	1-15	5
	Final practical Exam	16 <sup>th</sup> week	10
	Final exam	17-19	40
	<b>Total</b>		<b>100</b>

\*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).



## E. Learning Resources and Facilities

### 1. References and Learning Resources

Essential References	<ol style="list-style-type: none"> <li>Handbook of Plant Biotechnology, 2 Volume Set <a href="https://www.wiley.com/en-us/Handbook+of+Plant+Biotechnology%2C+2+Volume+Set-p-9780471851998">https://www.wiley.com/en-us/Handbook+of+Plant+Biotechnology%2C+2+Volume+Set-p-9780471851998</a></li> <li>Plant Tissue Culture: Techniques and Experiments <a href="https://books.google.com.sa/books?id=SUbi3gCg2PsC&amp;printsec=frontcover&amp;dq=plant+tissue+culture+handbook&amp;hl=en&amp;sa=X&amp;ved=2ahUKEwi-x-n4xtH1AhV1QkEAHQmyCzkQ6AF6BAgGEAI#v=onepage&amp;q=plant%20tissue%20culture%20handbook&amp;f=false">https://books.google.com.sa/books?id=SUbi3gCg2PsC&amp;printsec=frontcover&amp;dq=plant+tissue+culture+handbook&amp;hl=en&amp;sa=X&amp;ved=2ahUKEwi-x-n4xtH1AhV1QkEAHQmyCzkQ6AF6BAgGEAI#v=onepage&amp;q=plant%20tissue%20culture%20handbook&amp;f=false</a></li> </ol>
Supportive References	<ol style="list-style-type: none"> <li>Animal Cell Culture <a href="#">Animal Cell Culture - Google Books</a></li> <li>Healthcare Biotechnology: A Practical Guide <a href="https://books.google.com.sa/books?id=9D7OBQAAQBAJ&amp;printsec=frontcover&amp;dq=practical+biotechnology+handbook&amp;hl=en&amp;sa=X&amp;ved=2ahUKEwiImqvQx9H1AhV1QkEAHQmyCzkQ6AF6BAgGEAI#v=onepage&amp;q&amp;f=false">https://books.google.com.sa/books?id=9D7OBQAAQBAJ&amp;printsec=frontcover&amp;dq=practical+biotechnology+handbook&amp;hl=en&amp;sa=X&amp;ved=2ahUKEwiImqvQx9H1AhV1QkEAHQmyCzkQ6AF6BAgGEAI#v=onepage&amp;q&amp;f=false</a></li> <li>Basic Cell Culture: A Practical Approach <a href="#">Basic Cell Culture: A Practical Approach - Google Books</a></li> </ol>
Electronic Materials	<a href="http://www.dlaf.nu.edu.sa">www.dlaf.nu.edu.sa</a>
Other Learning Materials	Videos and lectures available at khan academy webpage <a href="https://www.khanacademy.org/science/biology/biotech-dna-technology">https://www.khanacademy.org/science/biology/biotech-dna-technology</a>

### 2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	<ul style="list-style-type: none"> <li>- A Suitable lecture room equipped with data show and internet, and sufficient number of seats.</li> <li>- Suitable laboratories equipped with health and safety tools, internet, and sufficient number of seats.</li> </ul>
Technology equipment (projector, smart board, software)	<ul style="list-style-type: none"> <li>- Computer</li> <li>- Internet access</li> <li>- Data show</li> </ul>
Other equipment (depending on the nature of the specialty)	<ul style="list-style-type: none"> <li>- Plant tissue culture glasses and media components</li> <li>- Water bath</li> <li>- flame gases</li> <li>- Automatic pipettes</li> <li>- Autoclave</li> <li>- Laminar flow cabinet</li> </ul>

## F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Head of department Students	Indirect Indirect
Effectiveness of students assessment	Faculty members Students	Indirect Indirect
Quality of learning resources	Faculty members Students	Indirect Indirect
The extent to which CLOs have been achieved	Faculty members Student	Direct Indirect
others		

**Assessors** (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

**Assessment Methods** (Direct, Indirect)

## G. Specification Approval

<b>COUNCIL /COMMITTEE</b>	<b>PHARMACOGNOSY DEPARTMENT COUNCIL</b>
<b>REFERENCE NO.</b>	<b>14460213-1061-00001</b>
<b>DATE</b>	<b>20-08-2024</b>