



Course Specification

(Bachelor)

Course Title: **Pharmaceutical biotechnology**

Course Code: **322 PHG-3**

Program: **Pharmaceutical Sciences**

Department: **Pharmacognosy**

College: **College of Pharmacy**

Institution: **Najran University**

Version: **1**

Last Revision Date: **25-12-2023**

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A. General information about the course:

1. Course Identification

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

2. Course type

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

3. Level/year at which this course is offered: (Level 6th / 3rd year)

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 will be also discussed, parallelly.

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

Pharmacognosy – 2 (321 PHG-3)

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 applications
3. Illustrate the fundamental principles of protein structure, diseases associated with protein deformities, methods of protein purification.
4. Recognize the gene expression process, and gene therapy and its application.
5. Illustrate the principles and applications of vaccine, monoclonal antibody, recombinant DNA technology.
6. Illustrate the principles and techniques of gel electrophoresis, PCR and ELISA.
7. 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"> Traditional classroom E-learning 		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30
2.	Laboratory/Studio	30
3.	Field	0
4.	Tutorial	0
5.	Others (specify)	0
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 exam Assignment
2.0	Skills			
2.1	Integrate cell biology and genetic information to produce pharmaceutically active compounds,	S4	Lectures	Written exam Assignment



Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
	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	Practical exam Presentation
2.3	Interpret results from gel electrophoresis, PCR, and ELIZA experiments	S4	Lectures Laboratory work	Written exam Practical exam
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 session	Practical exam Observation card

C. Course Content

No	List of Topics (Theoretical)	Contact Hours
1.	<ul style="list-style-type: none"> - Definition, scope and importance of different types of biotechnology - Basic principles and terminology of Plant Tissue Culture - Requirements of plant cell culture lab. - Types of plant tissue culture media components - Definition and types of plant Cell and tissue - Factors affecting plant tissue culture - Application of Plant cell and tissue culture 	8
2.	<ul style="list-style-type: none"> - Protein structure, and protein abnormalities and caused disease. - Protein purification, and protein applications - Animal- cell culture techniques, Scale-up of animal cell culture, and Applications of animal cell culture - Gene expression concepts and importance 	8
3.	<ul style="list-style-type: none"> - Stem- cell technology and application <p>Basic approach to gene therapy, Disease targets for gene therapy, gene therapy (Viral vectors and non-viral vectors)</p>	6
4.	<ul style="list-style-type: none"> - Monoclonal antibodies principles and applications <p>Recombinant DNA technology concepts and applications</p>	4
5.	<ul style="list-style-type: none"> - Polymerase Chain Reaction (PCR) - Electrophoresis <p>Vaccine technology, types of vaccines and application</p>	4
Total		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
Total		30

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quiz-1	4 th week	5
2.	Med-term	8 th week	20
3.	Quiz-2	11 th Weekly	5
4.	Assignment	14 th week	5
5.	Observation card	15 th week	10
6.	Presentation	15 th week	5
7.	Final practical exam	16 th week	10
8.	Final written exam	17 th week	40
Total			100

*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	1. Handbook of Plant Biotechnology, 2 Volume Set https://www.wiley.com/en-us/Handbook+of+Plant+Biotechnology%2C+2+Volume+Set-p-9780471851998
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	2. Plant Tissue Culture: Techniques and Experiments https://books.google.com.sa/books?id=SUbi3gCg2PsC&printsec=frontcover&dq=plant+tissue+culture+handbook&hl=en&sa=X&ved=2ahUKEw i-x- n4xtH1AhV1QkEAHQmyCzkQ6AF6BAgGEAI#v=onepage&q=plant%20tissue%20culture%20handbook&f=false
Supportive References	1. Animal Cell Culture Animal Cell Culture - Google Books 2. Healthcare Biotechnology: A Practical Guide https://books.google.com.sa/books?id=9D7OBQAAQBAJ&printsec=frontcover&dq=practical+biotechnology+handbook&hl=en&sa=X&ved=2ahUKEwiImqvQx9H1AhV1QkEAHQmyCzkQ6AF6BAgGEAI#v=onepage&q&f=false 3. Basic Cell Culture: A Practical Approach Basic Cell Culture: A Practical Approach - Google Books
Electronic Materials	www.dlaf.nu.edu.sa
Other Learning Materials	Videos and lectures available at khan academy webpage https://www.khanacademy.org/science/biology/biotech-dna-technology

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	1. A Suitable lecture room equipped with data show, internet, and sufficient number of seats. 2. Suitable laboratories equipped with health and safety tools, internet, and sufficient number of seats.
Technology equipment (projector, smart board, software)	1. Computer 2. Internet access 3. Data show
Other equipment (depending on the nature of the specialty)	- Plant tissue culture glasses and media components - Water bath - flame gases - Automatic pipettes - Autoclave - Laminar air flow cabinet

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Head of department Students	Indirect Questionnaires (indirect)
Effectiveness of Students assessment	Faculty members Students	Indirect Questionnaires (indirect)
Quality of learning resources	Student Peer reviewer	Direct Indirect



Assessment Areas/Issues	Assessor	Assessment Methods
The extent to which CLOs have been achieved	Faculty members Students	Direct Questionnaires (indirect)
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	PHARMACOGNOSY DEPARTMENT COUNCIL
REFERENCE NO.	14450612-0511-00010
DATE	25-12-2023

