|  |  |
| --- | --- |
| **Course Title:** | **Pharmaceutical biotechnology** |
| **Course Code:** | **PHGN 423** |
| **Program:** | **Pharmaceutical Sciences** |
| **Department:** | **Pharmacognosy** |
| **College:** | **Pharmacy** |
| **Institution:** | **Najran University** |

Table of Contents

[A. Course Identification 3](#_Toc951372)

[6. Mode of Instruction (mark all that apply) 3](#_Toc951373)

[B. Course Objectives and Learning Outcomes 4](#_Toc951374)

[1. Course Description 4](#_Toc951375)

[2. Course Main Objective 4](#_Toc951376)

[3. Course Learning Outcomes 4](#_Toc951377)

[C. Course Content 4](#_Toc951378)

[D. Teaching and Assessment 5](#_Toc951379)

[1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods 5](#_Toc951380)

[2. Assessment Tasks for Students 6](#_Toc951381)

[E. Student Academic Counseling and Support 6](#_Toc951382)

[F. Learning Resources and Facilities 7](#_Toc951383)

[1.Learning Resources 7](#_Toc951384)

[2. Facilities Required 7](#_Toc951385)

[G. Course Quality Evaluation 7](#_Toc951386)

[H. Specification Approval Data 8](#_Toc951387)

# A. Course Identification

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **1. Credit hours:** | | | | | | | | **3 hours (2+1)** | | | | | | |
| **2. Course type** | | | | | | | | | | | | | | |
| **a.** | University | |  | College | | | √ | Department |  | | Others |  | |  |
| **b.** | | Required | | | **√** |  | | Elective | |  | | |  | |
| **3. Level/year at which this course is offered:** | | | | | | | | **7th Level/4th year** | | | | | | |
| **4. Pre-requisites for this course** (if any)**:**  **PHGN 322** | | | | | | | | | | | | | | |
| **5. Co-requisites for this course** (if any)**:** | | | | | | | | | | | | | | |
| **NONE** | | | | | | | | | | | | | | |

## 6. Mode of Instruction (mark all that apply)

| **No** | **Mode of Instruction** | **Contact Hours** | **Percentage** |
| --- | --- | --- | --- |
| **1** | **Traditional classroom** | 60 | 100 |
| **2** | **Blended** |  |  |
| **3** | **E-learning** |  |  |
| **4** | **Correspondence** |  |  |
| **5** | **Other (practical)** |  |  |

**7. Actual Learning Hours** (based on academic semester)

|  |  |  |
| --- | --- | --- |
| **No** | **Activity** | **Learning Hours** |
| **Contact Hours** | | |
| **1** | **Lecture** | 30 |
| **2** | **Laboratory/Studio** | 30 |
| **3** | **Tutorial** | 0 |
| **4** | **Others** (specify) | 0 |
|  | **Total** | 60 |
| **Other Learning Hours\*** | | |
| **1** | **Study** | 40 |
| **2** | **Assignments** | 10 |
| **3** | **Library** | 0 |
| **4** | **Projects/Research Essays/Theses** | 0 |
| **5** | **Others** (specify) | 0 |
|  | **Total** | 110 |

**\*** 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 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. The 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. |
|  |
| 2. Course Main Objective  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. 6. Analyze and interpret experimental results. |
|  |

## 3. Course Learning Outcomes

| **CLOs** | | **Aligned****PLOs** |
| --- | --- | --- |
| 1 | **Knowledge:** |  |
| 1.1 | Recognize the concepts, principles, techniques, and applications used in the pharmaceutical biotechnology including plant cell culture, animal cell culture and the all topics mentioned above. | K1 |
| **2** | **Skills:** |  |
| 2.1 | Integrate cell biology and genetic information to produce pharmaceutically active compounds, biomolecules, and genetic fragments for solving human health problem | S1 |
| 2.2 | Prepare plant culture medium and use them for induction of plant tissue culture | S1 |
| 2.3 | Interpret results from gel electrophoresis, PCR, and ELIZA experiments | S1 |
| 2.4 | Communicate clearly by written and verbal means using technical and theoretical expression of biotechnology | S4 |
| **3** | **Competence:** |  |
| 3.1 | Work independently to obtain his goal of the study or research points through the internet. | C1 |

# C. Course Content

|  |  |  |
| --- | --- | --- |
| **No** | **List of Topics** | **Contact Hours** |
|  | 1. **Lectures** |  |
| 4 | * 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** |
| 3 | * Protein as biotech products, protein structure, and protein purification, and protein applications * Protein abnormalities caused disease * Gene expression concepts and importance * Animal- cell culture techniques * Scale-up of animal cell culture * Applications of animal cell culture | **8** |
| 3 | * Stem- cell technology and application Recombinant DNA Technology concepts, types, and applications * Basic approach to gene therapy * Disease Targets for Gene Therapy * Vectors used in gene therapy (Viral vectors and non-viral vectors) | **6** |
| 2 | * Monoclonal antibodies principles and applications * Recombinant DNA technology concepts and applications | **4** |
| 2 | * Polymerase Chain Reaction (PCR) * Electrophoresis * Vaccine technology, types of vaccines and application | **4** |
|  | **Total** | **30** |
|  | 1. **Practical** | **30** |
| 1 | * Biotechnology laboratory principles and Safety |
| 2 | * Introduction to apparatus and techniques in Pharmaceutical Biotechnology |
| 3 | * Facilities and equipment of plant tissue culture medium |
| 4 | * Preparation and sterilization of Plant Culture media |
| 5 | * Preparation and sterilization plant explant |
| 6 | * Induction of plant growth |
| 7 | * Tools used for protein purification |
| 8 | * Components of animal culture media * Scale up animal culture media |
| 9 | * Isolation of DNA |
| 10 | * Polymerase Chain Reaction (PCR) |
| 11 | * Gel Electrophoresis |
| 12 | * ELISA |
| 13 | * Practical exam in week 15 |
| **Total** | | **30** |

# 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 | Recognize the concepts, principles, techniques and applications in the pharmaceutical biotechnology including plant cell culture, animal cell culture and.the all topics mentioned above. | Lectures | 1. Theoretical exams 2. Assignments |
|  |  |  |  |
| **2.0** | **Skills** | | |
| 2.1 | Integrate cell biology and genetic information to produce pharmaceutically active compounds, biomolecules, and genetic fragments for solving human health problem | Lectures | 1. Theoretical exams 2. Assignments |
| 2.2 | Prepare plant culture medium and use them for induction of plant tissue culture | Practical work | 1.Workplace-based Assessment |
| 2.3 | Interpret results from gel electrophoresis, PCR, and ELIZA experiments | Lectures  Practical work | 1. Theoretical exams 2. Practical Exam |
| 2.4 | Communicate clearly by written and verbal means using technical and theoretical expression of biotechnology |  | 1. Theoretical exams 2. Assignments |
|  |  |  |  |
| **3.0** | **Competence** | | |
| 3.1 | Use properly and confidently the tools and equipments in the biotechnology laboratory according to the rules of biotechnology lab. rules and safety procedures | Lab. work | 1. Workplace-based Assessment 2. Practical Exam |
|  |  |  |  |

## 2. Assessment Tasks for Students

| **#** | **Assessment task\*** | **Week Due** | **Percentage of Total Assessment Score** |
| --- | --- | --- | --- |
| 1 | Midterm exam **1** | 6 | 15% |
| 2 | Individual assignments | 12 | 5% |
| 3 | Lab. practical quiz | 9 | 5% |
| 4 | Midterm exam **2** | 10 | 15% |
| 5 | Observation card in lab | 2-12 | 5% |
| 6 | Final practical Exam | 15 | 15% |
| 7 | Final exam | 17 | 40% |
|  | Total |  | 100% |

**\*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 :** |
| * Office hours (2 hours per week + appointments). * Student counselling: as required per week.   (for advising and counselling and to correct the student pathway in the suitable time and to fulfill the course ILOs. Following the student’s marks in the quizzes and midterm exams and identification of the reason of low marks. |

# F. Learning Resources and Facilities

## 1. Learning Resources

|  |  |
| --- | --- |
| **Required Textbooks** | 1. Experiments in Plant Tissue Culture”; Dodds, J and Roberts L. Cambridge University Press (1982). 2. Genetics; Weaver, F. R and Hedrick, P. W. 3rd Ed. WCB (1996). |
| **Recommended References** | 1. Plant Gene Isolation; Foster, G. D. Twell, D; John Wiley& Sons (1996). 2. Plant Cell and Tissue Culture ; Reinert ,J and Yeoman, M. M; Springer-Verlag (1982) 3. Methods in Plant Molecular Biology, Schuler, M.A and Zialinski R. E. Academic Press. Inc. (1989). 4. Basic Cell Culture; Davis, J. M; IRL Press (1994). |
| **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. Facilities Required

| **Item** | **Resources** |
| --- | --- |
| **Accommodation**  (Classrooms, laboratories, demonstration rooms/labs, etc.) | * A Suitable lecture room equipped with data show and internet, and sufficient number of seats. * Suitable laboratories equipped with health and safety tools, internet, and sufficient number of seats. |
| **Technology Resources**  (AV, data show, Smart Board, software, etc.) | * Computer * Internet access * Data show |
| **Other Resources**  (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list) | 1. Plant tissue culture glasses and media components 2. Water bath 3. flame gases 4. Automatic pipettes 5. Autoclave 6. Laminar flow cabinet |

# G. Course Quality Evaluation

| **Evaluation**  **Areas/Issues** | **Evaluators** | **Evaluation Methods** |
| --- | --- | --- |
| Effectiveness of teaching strategies | Head of departments  and students | Indirect  Questionnaires (indirect) |
| Effectiveness of student assessment | Faculty members  and students | Indirect  Questionnaires (indirect) |
| Achievement of CLOs | Student  peer reviewer | Direct  Indirect |
|  |  |  |

**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** | Pharmacognosy department council |
| **Reference No.** | Council No. 1 |
| **Date** | 25/8/2019 |