**Course Description**

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| Faculty | Pharmacy | | | | | | |
| Department | Pharmaceutics and Pharmaceutical Technology | | | **Level** | | | 7 |
| Course | Development and production of biopharmaceuticals | **Code** | 1701541 | **Prerequisite** | | | 1701304 |
| Credit hours | 3 | **Theoretical** | 3 | **Practical** | | |  |
| Coordinator |  | **Email** |  | | | | |
| Teachers | Dr. Yasser Gaber | **Emails** |  | | | | |
| Lecture Time |  | **Place** |  | | **Attendance mode** | Face to face | |
| Semester |  | **Preparation date** |  | | **Modification Date** |  | |

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| Abstracted Course Description |
| The course is elective course and will be taught to students who have interest in development and production of biopharmaceuticals such as vaccines, monoclonal antibodies, peptides and pharmaceutical proteins. The course topics include recombinant DNA technology, production of therapeutic proteins, monoclonal antibodies, vaccines, fermentation and fermenter operation, and related applications. The course will motivate students to be entrepreneurs in the field of biopharmaceuticals business. |
| Course Goals |
| 1. **Knows the principles of biopharmaceutical production** 2. **Calculate the fermentation kinetics (yield, specific growth rate, volumetric productivities for products and biomass, specific productivities for product and biomass)** 3. **Know the advanced DNA techniques** 4. **Know the advanced techniques of protein technology ( production, different chromatography techniques )** |

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| **CILOs** | | | | | |
| **Knowledge** | | | | | |
| A.1 Define the connection between microbial growth and product formation as well as the different modes of fermentation operation  A.2 Know the processes of protein, peptide, oligomer production, synthesis and purification  A.3 Know examples of biopharmaceuticals and their applications | | | | | |
| **Skills** | | | | | |
| B.1 Demonstrate ability to calculate fermentation metrics such as mu max , productivity  B.2 Be able to identify proper purification for certain proteins | | | | | |
| **Competencies** | | | | | |
| . C.1 Suggest suitable purification technique for the purification of fermentation product which  C.2 could be one of the following : centrifugation, filtration and chromatographic separation.  C3 Use IT to search on certain selective subjects | | | | | |
| **Learning Methods** | | | | | |
| * Lectures * Oral discussion * Assignment | | | | | |
| **Evaluation Tools** | | | | | |
| **Exams**  **Quiz** | | | | | |
| **Week** | **Topics** | **Learning methods** | **Evaluation tool** | **ILOs** | **Hours** |
| **1.** | Recombinant DNA technology | Ms team Lecture & Text book | QUIZ | **A** | **3** |
| **2.** | Fermentation definition and introduction |
| **3.** | Growth kinetics  Calculations of parameter (productivity , volumetric productivity, yield , mu max )  Problems | Ms team Lecture & Text book | Assignment | **A** | **3** |
| **4.** | Proteins I , basics and introduction to pharmaceutical proteins  Peptides, proteins , Cohn method, Solid state protein synthesis | Ms team Lecture & Text book | **B** | **3** |
| **5.** | Protein II ,  Basic of protein sciences and its techniques, SDS-PAGE, Purification, Proteomics |
| **6.** | Pharmaceutical products : monoclonal antibodies | Ms team Lecture & Text book | Exam | **B** | **3** |
| **7.** | Pharmaceutical products : monoclonal antibodies | Ms team Lecture & Text book | Exam |  | **3** |
| **8.** | **Viruses as transfecting agents and Vaccine production** | Ms team Lecture & Text book | **C** | **3** |
| **9.** | Proteins I , basics and introduction to pharmaceutical proteins  Peptides, proteins , cohn method | Ms team Lecture & Text book | Exam | **B** | **3** |
| **10.** | Proteins I , basics and introduction to pharmaceutical proteins  Peptides, proteins , cohn method | Ms team Lecture & Text book | **A** | **3** |
| **11.** | Entrepreneurship in Biotechnology | Ms team Lecture & Text book | homework | **B** | **3** |
| **12.** | Student presentation | Ms team Lecture & Text book | **A** | **3** |
| **13.** | Student presentation | Ms team Lecture & Text book |  | **C** | **3** |
| **14.** | Revision | Ms team Lecture & Text book | **B** | **3** |
| **16.** | Final Examinations | Ms team Lecture & Text book | Exam |  | **2** |

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| |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **Plan of Course Evaluation** | | | | | | | | | | | | | **Evaluation Tools** | | **Mark** | **ILOs** | | | | | | | | | | **A1** | **A2** | **A3** | **B1** | **B2** | **B3** | **C1** | **C2** | **C3** | | **First Exam (Mid-term)** | | **30%** | \* | \* | \* |  |  |  |  |  |  | | **Second Exam (If available)** | |  |  |  |  |  |  |  |  |  |  | | **Final Exam** | | **50%** |  |  | \* | \* | \* |  |  |  |  | | **Activities** | | **20%** |  | | | | | | | | | | **Activities Evaluation** | Homework/Tasks | 10% | \* |  | \* |  | \* |  |  |  |  | | Case Study |  |  |  |  |  |  |  |  |  |  | | Discussion and Interactions |  |  |  |  |  |  |  |  |  |  | | Group Activities |  |  |  |  |  |  |  |  |  |  | | Laboratory Exams |  |  |  |  |  |  |  |  |  |  | | Presentations |  |  |  |  |  |  |  |  |  |  | | Quizzes | 10% |  | \* | \* |  | \* |  |  |  |  | | Others |  |  |  |  |  |  |  |  |  |  | | **Total** | | 100% |  |  |  |  |  |  |  |  |  |   **Components** | |
| **Book** | **Basic Immunology**   1. Pharmaceutical biotechnology , springer publisher 2006   Suggested Books   1. Brock Biology of Microorganisms 2. -Isolation and purification in Biotechnology 3. -Gene cloning and manipulation 4. -Analysis of Genes and Genomes   2 . Journals  2.1-Microbial cell factories  2-2.Biotechnology for biofuels  2.3-Biotechnology and Bioengineering  2.4-Applied and Environmental Microbiology  2.5-Applied Microbiology and Biotechnology  2.6-Recent trends in Biotechnology (Reviews)  2.7-Current opinion in biotechnology (Reviews) |
| **References** | 1. Pharmaceutical biotechnology , springer publisher 2006   Suggested Books   1. Brock Biology of Microorganisms 2. -Isolation and purification in Biotechnology 3. -Gene cloning and manipulation 4. -Analysis of Genes and Genomes   2 . Journals  2.1-Microbial cell factories  2-2.Biotechnology for biofuels  2.3-Biotechnology and Bioengineering  2.4-Applied and Environmental Microbiology  2.5-Applied Microbiology and Biotechnology  2.6-Recent trends in Biotechnology (Reviews)  2.7-Current opinion in biotechnology (Reviews) |
| **Recommended Readings** |  |
| **Electronic materials** |  |
| **Other websites** |  |

**Subject Coordinator:**

**Head of Curriculum Committee:**

**Department Head:**

**Faculty Dean:**

**Last update date:**