**Course specification**
**2017- 2018**
**Faculty of Pharmacy**
**Mansoura University**

Level five

Course specification of Pharmaceutical Biotechnology

**University:** Mansoura
**Faculty :** Pharmacy
**Department :** Microbiology and Immunology
**Course title:** Pharmaceutical Biotechnology

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| **Program on which the course is given** | B. Pharm |
| **Academic Level** | Fifth Level, semester one |
| **Date of course specification approval** | 19/3/2018 |

## 1- Basic Information : Course data :

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| **Course title:** | Pharmaceutical Biotechnology | **Code:** PM526 | |
| **Specialization:** | Pharmaceutical Courses | | |
| **Prerequisite:** | | | |
| **Teaching Hours:** | **Lecture:** 2 | **Practical:**1 | |
| **Number of units: (credit hours)** | 3 | | |

## 2- Course Aims:

On completion of the course, the student will be able to describe the different concepts of fermentation and industrial microbiology, describe the different concepts of genetic engineering, PCR, mutation, mutagen, recombinant DNA technology and gene therapy, and describe different means of getting rid of wastes and pollutants, bioremediation and bioconversion of wastes and other cheap under-utilized material to produce certain useful pharmaceuticals.

## Intended learning outcomes ($ILO_S$):

### a- Knowledge and understanding

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| **a1** | Describe the role of genomics and biotechnology in the discovery of new remedies. |
| **a2** | Explain the principles of bioremediation and genetic engineering. |
| **a3** | Know the applications of genetic engineering in pharmaceutical industry. |

### b- Intellectual skills

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| **b1** | Outline the different substances produced by microorganisms |
| **b2** | Analyze how to encode and transefere regions of the genetic material of the microorganisms. |
| **b3** | Apply how biotechnology exploits the diversity of the microbial world in the production of drugs |

## c- Professional and practical skills

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| c1 | Manage pharmaceutical instruments and equipment safely and efficiently. |
| c2 | Solve commonly encountered problems in pharmaceutical manufacturing processes. |
| c3 | Isolate and identify antibiotics producing microorganisms from the soil and determine the antibiogram of the produced compounds |
| c4 | Clone the encoding regions and transefere them to bacteria. |

## d- General and transferable skills

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| d1 | Work effectively in team. |
| d2 | Communicate effectively in a scientific language. |
| d3 | Adopt professional ethical, legal and safety guidelines in pharmacy practice |

## 3- Contents:-

| Week No | Topics | No.of hours | Lecture (hr.) | Practical |
|---|---|---|---|---|
| 1. | Introduction to biotechnology, fermentation and industrial microbiology. | 2 | 2 hr | |
| 2. | Industrial microorganisms and fermentation media. | 2 | 2 | |
| 3. | Fermentation techniques, fermenters and bioreactors. | 2 | 2 | |
| 4. | Fermentation upstream and downstream processes. | 2 | 2 | |
| 5. | Applications of fermentation process. | 2 | 2 | |
| 6. | Bioremediation and bioleaching. | 2 | 2 | |
| 7. | **Week 7 Mid-term** | - | - | |
| 8. | Introduction to microbial genetics: DNA and RNA structure and function. | 2 | 2 | |
| 9. | Types of RNA, Genetic code, Protein synthesis and methods of DNA transfer. | 2 | 2 | |
| 10. | Cloning, DNA mutation and repair. | 2 | 2 | |
| 11. | PCR and DNA sequencing methods. | 2 | 2 | |
| 12. | Genetic engineering and gene therapy. | 2 | 2 | |
| 13. | Applications of genetic engineering and gene therapy.<br>Revision/Open discussion | 2 | 2 | |
| 14. | Week 13 Practical | | | |
| 15. | **Week 15 Final written & oral** | | | |
| | **Practical topics** | | | |
| 1. | Introduction to biotechnology and fermentation. | 2 | | 1 |

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| **2.** | Shake flask fermentation. | 2 | | 1 |
| **3.** | Fermenter. | 2 | | 1 |
| **4.** | Isolation of soil bacteria. | 2 | | 1 |
| **5.** | Identifying antibiotic producing microorganisms from soil. | 2 | | 1 |
| **6.** | Assessment of antimicrobial production from the soil isolates. | 2 | | 1 |
| **7.** | **Mid Term** | | | |
| **8.** | Mutation. | 2 | | 1 |
| **9.** | Polymerase chain reaction (PCR). | 2 | | 1 |
| **10.** | Cloning. | 2 | | 1 |
| **11.** | Western blotting. | 2 | | 1 |
| **12.** | Industrial impact of biotechnology. | 2 | | 1 |
| **13.** | Activity/ Revision/ Open discussion. | 2 | | 1 |

## 4- Teaching and learning Methods:

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| **5.1** | **Lectures using white, video illustrations and data show.** |
| **5.2** | **Practical session using laboratory equipment (Microscopes and glass wares).** |
| **5.3** | **Research assignments.** |
| **5.4** | **Case study.** |

## 5- Student Assessment:

### a- Assessment methods:

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| **1-Written exam** | **To assess understanding, intellectual, and professional skills.** |
| **2-Practical exam** | **To assess professional and practical skills.** |
| **3-Oral** | **To assess Knowledge, understanding, intellectual skills, general skills and confidence.** |
| **4-Case study** | **To assess the skills of problem-solving and date presentation.** |

### b- Assessment schedule

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| **Assessment 1** | **Practical** | **13th week** |
| **Assessment 2** | **Mid-term** | **7th week** |
| **Assessment 3** | **Oral** | **15th week** |
| **Assessment 4** | **Written** | **15th week** |

### c- Weighting of assessments:

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| 1 | Mid-term examination | 10 % |
| 2 | Final-term examination | 50 % |
| 3 | Oral examination | 15 % |
| 4 | Practical examination & Semester work | 25 % |
| Total | | 100% |

## 6 - List of References

| N0. | Reference | type |
|---|---|---|
| 1 | Fundamentals of Biotechnology, 2009 | Book |
| 2 | Molecular biology and biotechnology 5th edition, 2012 | Book |
| 3 | http://www.ms-biotech.wisc.edu/biotech-websites.cfm | Website |
| 4 | http://biotechlearn.org.nz/ | Website |
| 5 | Lectures notes prepared by staff members | Course notes |

## 7- Matrix of knowledge and skills of the course

| No | Course contents | Study Week | ILOS | | | |
|---|---|---|---|---|---|---|
| | | | Knowledge & understanding | Intellectual skills | Professional and practical skills | General & transferable skills |
| 1. | Introduction to biotechnology, fermentation and industrial microbiology. | 1 | a1,a2 | b1 | c1 | d2 |
| 2. | Industrial microorganisms and fermentation media. | 1 | a1,a2 | b1, b2 | c1 | d2, d3 |
| 3. | Fermentation techniques, fermenters and bioreactors. | 1 | a1, a2,a3 | b1, b2 | c1, c2 | d1, d2, d3 |
| 4. | Fermentation upstream and downstream processes. | 1 | a2,a3 | b2, b3 | c3, c4 | d2, d3 |
| 5. | Applications of fermentation process. | 1 | a1, a2,a3 | b1, b2, b3 | c1, c2, c3, c4 | d2, d3 |
| 6. | Bioremediation and bioleaching. | 1 | a2,a3 | b2, b3 | c2, c3, c4 | d1, d2, d3 |
| 7. | Introduction to microbial genet ics: DNA and RNA structure a nd function. | 1 | a1,a2 | b1, b2 | c1, c2 | d2 |
| 8. | Types of RNA, Genetic code, Protein synthesis and methods of DNA transfer. | 1 | a1,a2 | b1, b2 | c1, c2 | d2 |
| 9 | Cloning, DNA mutation and repair. | 1 | a1,a2 | b1, b2 | c1, c2 | d1, d2, d3 |
| 10 | PCR and DNA sequencing | 1 | a1,a2 | b1, b2 | c1, c2 | d1, d2, d3 |

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| | methods. | | | | | |
| 11 | Genetic engineering and gene therapy. | 1 | a1, a2,a3 | b1, b2, b3 | c1, c2, c3 | d1, d2, d3 |
| 12 | Applications of genetic engineering and gene therapy. Revision/Open discussion | | a2,a3 | b2, b3 | c1, c2, c3, c4 | d1, d2, d3 |

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| **Course Coordinator:** | **Professor Dr Ramdan Hassan Ibrahim** |
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| **Head of department:** | **Professor Dr Rasha M. Fathy Barwa** |