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**Department of Plant protection**

**College of Agricultural Engineering Sciences**

**Salahaddin University**

**Subject: Biotechnology**

**Course Book – (Year 3)**

**Lecturer's name: Tavga Sulaiman Rashid, PhD**

**Academic Year: 2021/2022**

**Course Book**

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| **1. Course name** | **Biotechnology** |
| **2. Lecturer in charge** | **Dr. Tavga Sulaiman Rashid** |
| **3. Department/ College** | **Plant protection department/ Agriculture college**  |
| **4. Contact** | **e-mail:** **tavga2020@yahoo.com****,** **tavga.rashid@su.edu.krd****Tel: 009647504524781** |
| **5. Time (in hours) per week**  | **Theory: 2** **Practical: 3**  |
| **6. Office hours** | **Availability of the lecturer to the student during the week** |
| **7. Course code** |  |
| **8. Teacher's academic profile**  | **BCs (Bachelor of Science) from Faculty of Agriculture, plant protection department, at Salahaddin University, Erbil, Iraq in July 2004. After obtaining MSc (Master of Science) at the same college in January 2008 in Plant Pathology, cooperated as a lecture in Agriculture college, Salahaddin University for a period of 4 years. Received PhD from Faculty of Agriculture, plant protection department in University Putra Malaysia (UPM) May 2016. Published 24 journal articles, 2 patent, 2 Gold Medals, 1 Silver Medal, research projects, ‎seminar proceeding and workshops.‎** |
| **9. Keywords** | **Biotechnology, diagnoses of microorganism molecular identification and genetic engineering,**  |
| **10. Course overview:** The exploitation of biological systems has had a major commercial impact over the last decade. Biotechnology will continue to grow in the post genomic period, in areas ranging from drug discovery, to stem cell research and genetic engineering.As well as explaining the science behind biotechnology, this course also explains how new start-up biotechnology companies are created, how to explore the market potential of products and processes, how to create business plans and how money is raised from venture capitalists.Our courses are designed to produce graduates who will have a solid understanding of science, technology and agriculture management, along with the entrepreneurial skills required to exploit technological advances within a competitive environment.This blend of skills will be invaluable to future employers and provides a springboard for the budding biotechnology entrepreneurs of the future. |
| **11. Course objective:**To provide a general introduction to the molecular basis of genetics, how genes are maintained from one generation to the next and how their expression is regulated in various systems.To equip students with the basic laboratory skills necessary to study the Life Sciences with a focus on Molecular techniques. This unit will provide the foundation for more advanced laboratory skills units. |
| **12. Student's obligation**Students must complete Learning assessments based on lecture material and supplementary lecture-related material. Research and reading is required to complete these. There is a voluntary competition where students must identify, and describe unknown molecular structures. |
| **13. Forms of teaching**The lecturer will uses data show by preparing PowerPoint presentations in which outlines of each lecture will be shown however the details of the lecture will be narrated by the lecturer herself. In some cases, samples will be shown to students to have a close and real idea on the subject. |
| **14. Assessment scheme**Students are evaluated during the semester for the theory part by daily short quizzes which giving 5 marks out of 25. Two term exams 20 mark each out of 25. The practical part is given 15 marks in total.‌ |
| **15. Student learning outcome:**Students will understand the basis of genome maintenance and gene expression, and appreciate the concept of mutation at the level of the genotype and how this manifests at the phenotypic level. The major concepts and principles underlying recombinant DNA technology will be understood, along with major applications and associated issues relating to the public understanding of science. |
| **16. Course Reading List and References‌:**▪ Key references:* NAIR, A. J. (2011). Introduction to biotechnology and genetic engineering.
* Rapley, R., & Whitehouse, D. (Eds.). (2015). Molecular biology and biotechnology. Royal Society of Chemistry.
* Yount, L. (2000). Biotechnology and genetic engineering.
* Gupta, P. K., & Durzan, D. J. (1987). BIOTECHNOLOGY OF SOMATIC POLYEMBRYOGENESIS AND PIANTLET REGENERAflON IN LOBLOLLY PINE. Biotechnology, 5, 147.
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| **17. The Topics:** | **Lecturer's name** |
| 1. **Introduction of biotechnology**

1.1 What is biotechnology?‎1.2 History of biotechnology1.3 Type of cells | (2 hrs)3/10/2018 |
| 1. **The Tools of Biotechnology Laboratory**
 | (2 hrs)10/10/2018 |
| 1. **Plant Disease Detection (Microbial Diagnostics)**
2. Classical Microbiological Diagnosis
	1. Fluorescence Imaging
	2. Hyperspectral Techniques
	3. Portable Sensors
	4. Biosensor Platforms Based on Nanomaterials
 | (2 hrs)17/10/2018 |
| **4.****2. Current Methods for Crop Disease Detection**2.1 Fluorescence in-situ hybridization (FISH)2.2 Enzyme-linked immunosorbent assay (ELISA)2.3 Immunofluorescence (IF)2.4 Flow cytometry (FCM)* 1. Polymerase chain reaction (PCR)
 | (2 hrs)24/10/2018 |
| **5. Basic Molecular Biology Techniques**4.1 Enzymes Used in Molecular Biology4.2 Isolation and Separation of Nucleic Acids4.3 Nucleic Acid Amplification Techniques4.4 Electrophoresis of Nucleic Acids4.5 Polymerase chain reaction (PCR) | (2 hrs)31/10/2017 |
| 1. **Types of PCR**

PCR Primer Design | (2hrs)7/11/2017 |
| 1. **Molecular Cloning**

7.1 Key DNA Technologies7.2 Molecular Cloning Outline7.3 Cloning Vectors‎7.4 The Cloning Process‎ | (2 hrs)14/11/2017 |
| **8. Gene transfer to plants**8.1 Gene transformation8.2 Direct methods8.3 Indirect methods | (2 hrs)21/11/2017 |
| **9.**  **Biotechnology-based Drug Discovery**9.1 Metabolism and phyto-compounds9.2 Gas Chromatography- Mass Spectrometry (GCMS)9.3 Liquid Chromatography- Mass Spectrometry (LCMS)9.4 High-performance liquid chromatography (HPLC)9.5 Nuclear magnetic resonance spectroscopy (NMR) | (2 hrs)28/11/2017 |
| **10. Tissue Culture: The Manipulation of Plant Development**10.1 History10.2 Media and Culture Conditions10.3 Sterile Technique10.4 Culture Conditions and Vessels9.5 Culture Types and Their Uses | (2 hrs)5/12/2017 |
| **11. Plant Biotechnology**11.1 Applications of Molecular Biology11.2 Engineering Crop Resistance to Herbicides11.3 Engineering Resistance to Pests And Diseases | (2 hrs)12/12/2017 |
| **12. Protein Engineering**12.1 Protein Structures12.2 Sequence Identification12.3 Structure Determination and Modelling12.4 Sequence Modification | (2 hrs)19/12/2017 |
| **13. Bionanotechnology**13.1 What is Nanotechnology13.2 Nanotechnology and Agriculture | (2 hrs)26/12/2017 |
| **14. Recombinant DNA, Vector Design, and Construction ‎**14.1 DNA Modification14.2 DNA Vectors14.3 Vector Design14.4 Targeted Transgene Insertions14.5 Prospects | (2 hrs)2/1/2017 |
| **15. Biosensors**15.1 The Biological Reaction15.2 Electrochemical Methods15.3 Optical Biosensors | (2 hrs)9/1/2018 |
| **16. The Future of Plant Biotechnology** | (2 hrs)16/1/2018 |
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| **18. Practical Topics (If there is any)** |  |
| Introductory + Background of Biotechnology and the distinguish + similarities between Plant and Animal cells | Mr. Karzan Kazim |
| What are the differences between Prokaryotic and Eukaryotic cells? And what are the functions of cell organelles? |  |
| All definitions of Biotechnology processes and visiting biotechnology lab in other place. |  |
| Methods of (DNA and RNA extractions) and (Purifications and verifications) of them. |  |
| Electrophoretic Methods |  |
| Mid course examination + Molecular cloning I |  |
| Molecular Cloning II |  |
| Gene Transfer Techniques |  |
| Scientific trip to other biotechnology labs |  |
| Plant Biotechnology I |  |
| Plant Biotechnology II |  |
| Biotechnology in social welfare |  |
| Second exam & Revision |  |
| **19. Examinations:*****1.* Definitions,**such as: Biotechnology, gene expression,**2. What are the advantages and disadvantages of:**a. PCRb. ELISA**3. What are the differences between:** **such as:**DNA and RNA |
| **20. Extra notes:**Here the lecturer shall write any note or comment that is not covered in this template and he/she wishes to enrich the course book with his/her valuable remarks. |
| **21. Peer review پێداچوونه‌وه‌ی هاوه‌ڵ** I approve that the course is comprehensive and cover all the aspects of the course.Name:Degree:Specialty:Sign:Date: |