Postgraduate Course Book

Department: Biology

College: College of Education

University: Salahaddin University

Subject: Molecular Biotechnology

Course Book Level: M. Sc.; Second semester Lecturer's

Name: Asst. Prof. Dr. Hêro Farhad Salah

Academic Year: 2023/2024

Course Book

1. Course name	Biotechnology (Molecular Biotechnology)
2. Lecturer in charge	Asst. Prof. Dr. Hêro Farhad Salah
3. Department/ College	Department of Biology, College of Education
4. Contact	+9647504654468, hero.salah@su.edu.krd

5. Time (in hours) per week	Theory: 3 Practical:
6. Office hours	5 Hours
7. Course code	
8. Teacher's academic profile	-Ph.D. in Molecular Microbiology and Molecular Biotechnology, **University of Salahaddin-Erbil**, Kurdistan Region/Iraq in collaboration with **University of Malaya-Malaysia**, 2013-2017. **Thesis Title**: Cloning of Staphylokinase (*sak*) Gene from *Staphylococcus aureus* into *E. coli* Strain BL21(DE3) and Assessment its Properties *in vitro* and *in vivo*. -M.Sc. in Microbiology, University of Salahaddin-Hawler, College of Education, Biology Dept., 2004-2007. **Thesis Title**: Effect of Some Medicinal Plant Extracts on Antibiotic Resistance by Plasmids of *Escherichia coli* Isolated from Different Sources. **-Main Teaching Areas:** Molecular Biotechnology, Molecular Biology, Microbiology, Pathogenic Bacteria, *Comparative Anatomy of Chordates, Zoology*. **Trainings that participated:** 1. Real Time PCR (2019). Induction Course (2016). 2. Responsible Care and Use of laboratory Animal Course/ Rabbit (Techniques on Handling, Anesthesia, Euthanasia, Parenteral Administration and Blood Collection) - (2016). 3. Editing Your Manuscript for Publication (2016). 4. EndNote workshop: EndNote software Biology Dept.- College of Education/ Salahaddin University, 14-15 Nov. 2014.

	5. EndNote workshop: EndNote software Biology Dept.- College of Education/ Salahaddin University, 14-15Apr. 2013. 6. Training of e-Learning, Salahaddin University, (2012). 7. English Training Course, Salahaddin University, (2009). 8. Computer Training Course (ICDL), Salahaddin University, (2009). 9. Training of teaching methods, Salahaddin University, (2009). 10. Computer Training Course, (2004).
9. Keywords	**Molecular Biotechnology, Recombinant DNA Technology, Genetic Engineering, Molecular Cloning, Molecular Tools, Soft Biotechnology (Plant and Animal Tissue Culture), Molecular Markers, Gene Therapy, DNA sequencing.**

10. Course overview:

This module is a major (Mandatory) course for postgraduate students, and aims to present advanced knowledge in the field of molecular biotechnology.

Biotechnology: is the study of living tools"- it is used in agriculture, food processing, industrial production, environmental clean-up and medicine.

A set of modern tools that utilize living organisms or parts of it cell or tissue or genes/DNA to make or modify or improve plants or animals or develop microorganisms for specific use or their large scale production.

"Utilization of organisms or its organelles or biological process to make product or to solve problems for the welfare of mankind."

As such, (traditional) biotechnology has been practices since the beginning of records history. (It has been used to:) bake bread, brew alcoholic beverages, and breed food crops or domestic animals. But recent developments in molecular biology have given biotechnology new meaning, new prominence, and new potential. It is (modern) biotechnology that has captured the attention of the public. Modern biotechnology can have a dramatic effect on the world economy and society.

One example of modern biotechnology is genetic engineering. Genetic engineering is the process of transferring individual genes between organisms or modifying the genes in an organism to remove or add a desired trait or characteristic. Examples of genetic engineering are described later in this document. Through genetic engineering, genetically modified crops or organisms are formed.

This course will explore the principles and applications of DNA science with special reference to recombinant DNA technology. This course is highly recommended for students focusing career in medical field. Prerequisite: Junior or Senior Standing.

11. Course objective:

At the end of this module, student will:

- Able to offer a broad view of biotechnology, integrating historical, global current (classical and modern) and future applications.
- Demonstrate knowledge of essential facts of the history of biotechnology and description of key scientific events in the development of biotechnology
- Demonstrate knowledge of the definitions and principles of ancient, classical, and
- modern biotechnologies.
- Develop the basic laboratory techniques of a biotechnology or bioscience lab.
- Supplement and enrich the lecture portion of the course, which deals predominantly with biotechnology techniques.
- Develop critical thinking skills in the students.
- Encourage teamwork and accountability among the students.
- Develop multitasking skills.
- Demonstrate the steps of recombinant DNA technology and genetic engineering
- Manipulate DNA with restriction enzymes
- Construct recombinant vectors with novel properties
- Amplify DNA by polymerase chain reaction
- Identify a person based on DNA profile
- Encourage students to take charge of their learning.
- Learn the responsibilities associated with working in a company.
- Outline the ethical implications of biotechnology

Students are expected to behave professionally at all times. Notebooks will be maintained and graded in the lab. The lecture will provide background and relevant information about the solutions, prep, procedure and related techniques.

12. Student's obligation

Attendance: This is mandatory as there will be no makeup quizzes. A daily official class attendance record will be maintained and become part of each student's record.

Grading: The final grade of current semester will be the average of grades earned on final exam and the article review + seminar presentation + quiz + midterm exam.

Studying: How should you study for this course? Go over your lecture notes after each lecture, while the material is still fresh on your mind. Although some memorization is invariably necessary when learning a new "language", the goal of learning is to understand the information, not to simply memorize a bunch of disconnected "facts". A major purpose of studying is to discover what you don't understand so that you can do something about it. Don't just passively read the notes, think about them and ask yourself questions about them. Do you understand what was said? Does it make sense and why? Compare and contrast the new information with things that you have already learned. Some people find study groups very helpful for the learning process. Keep up regularly. You can't cram all of the information into your brain the night before an exam, and we may not be available to answer your questions at the last minute. For this upper division lecture course – you should plan to spend at least 4 hours per week OUTSIDE of class studying for this course.

13. Forms of teaching

To reach the objectives of the course, different forms of teaching will be used and which include the following: Presenting each lecture notes as a power point presentations (ppt.), sometimes writing the exciting notes on the whiteboard, and may be some related video (educational movies/YouTube/animation) will be showed in addition, answering the questions asked by students in the lecture and student discussion groups are encouraged.

14. Assessment scheme

- The grade will be determined by following assessment:
- Article Review **15%** of grade.
- Seminar Presentation 10%
- Quiz 5%
- Midterm Exam 20%
- Final Exam 50%

Total Score 100%

15. Student learning outcome:

The student will be familiar with main techniques in biotechnology.

- **Cognitive skills (thinking and analysis).**

The lecturer will present the material in the text book in an interactive way that stimulates the thinking side of students. Conducting the learning objectives for each module components in clear manner to insure the material is digested by the students.

- **Communication skills (personal and academic).**

-Module language: English
-For every lecture the last five minutes will be open for discussion. For further discussion, the students are welcome at the lecturer's office hour as appeared in first page.
-the students have the option to submit their module activities either by email or by hand
-the students are welcome to share open discussions through the net

- **Practical and subject specific skills (Transferable Skills).**

-Practical related session will be taken in the Practical sessions of Molecular Biology Lab/Department of Biology, College of Education-Salahaddin University-Erbil.

16. Course Reading List and References:

Books:

- David P. Clark. *Molecular Biology*. Waltham, MA: Academic Press, ©2013.
- Brown, T. A. *Gene Cloning and DNA Analysis an Introduction*, 6th Edition. Wiley-BlackWell. ©2010.
- Nair, A. J. *Introduction to Biotechnology and Genetic Engineering.* 7th edition. Infinity Science Press LLC. New Delhi, India, 2017.
- Godbey, W. T. *An Introduction to Biotechnology: The science, technology and medical Applications*. Academic Press is an imprint of Elsevier, 2014.

- Glick, B. R. and Patten, C. L. *Molecular Biotechnology: Principles and Applications of Recombinant DNA*, 6th edition. ASM Press, Washington DC, USA. 2022.
- Smith, J. E. *Biotechnology.* 5th Edition. Cambridge University Press. 2009.
- Chandrashekara, K.N. and Yakkaldevi, A. *Basic Concept of Biotechnology*. Laxmi Book Publication, Solapur. 2015.
- Petre, M. *Advances in Applied Biotechnology*. InTech. 2012.
- Wu, W., Welsh, M. J., Kaufman, P. B. and Zhang, H. H. *Gene Biotechnology*. 2nd Edition. CRC Press. 2004.
- Rao, J. R., Fleming, C. C. and Moore, J. *Molecular Diagnostics: Current Technology and Applications*. Horizon Bioscience. 2006.

Websites:

file:///C:/Users/M-Store/Downloads/biotechnology-foundations-2nd-edition-5.10.pdf

Journals:

- Biotechnology

Publisher: The Asian Network for Scientific Information
http://www.ansinet.org/c4p.php?j_id=biotech

- Genetics & Molecular Biology

Publisher: Brazilian Society for Genetics
http://www.scielo.br/cgi-bin/fbpe/fbsite?got=site &pid=1415-4757&lng=en

- American Journal of Biochemistry & Biotechnology

Publisher: The Asian Network for Scientific Information
http://ansinet.org/sciencepub/c4p.php?j_id=ajbb

17. Topics Program	Lecture's Name
Week 1: Introduction, Definition, Stages, Branches, Types, societal concerns in the biotechnology field.	Dr. Hêro for all involved weeks 22.2.2024
Week 2: Recombinant DNA Technology I: Molecular Cloning (Vectors)	29.2.2024
Week 3: Recombinant DNA Technology II: Molecular Cloning (RE)	7.3.2024
Week 4: Official holiday	14.3.2024
Week 5: Official Holiday (Newroz)	21.3.2024
Week 6: DNA Markers I	28.3.2024
Week 7: PCR	4.4.2024
Week 8: Holiday (Ramadhan eid)	11.4.2024
Week 9: qPCR	18.4.2024

Week 10: Midterm Exam	25.4.2024
Week 11: Nucleic acid extraction	2.5.2024

Week 12: Determination of Nucleic Acid Concentration and Purity	9.5.2024
Week 13: Determination of Nucleic Acid Concentration and Purity	16.5.2024
Week 14: Presentation duty	23.5.2024
18. Grading procedure	
19. Examinations:	
20. Extra notes:	
21. Peer review *	

* Must have permission of the Scientific and Higher Education Committee