



Department of Biology

College of Science

Salahaddin University - Erbil

Subject: Microbial Genetics

Course Book – (Year 4)

Lecturer's name: Mohamed Ali Saleem, M.Sc.

Academic Year: 2023/2024

Second Semester

Course Book

1. Course name	Microbial Genetics
2. Lecturer in charge	Lecturer Mohamed Ali Saleem
3. Department/College	Biology / Science
4. Contact	e-mail: mohammed.saleem@su.edu.krd Tel: 0750 413 21 45
5. Time (in hours) per week	Theory: 2 Practical: 2
6. Office hours	To be Return to the schedule on the office door
7. Course code	
8. Teacher's academic profile	<p>I graduated from Salahaddin University-Erbil in 2004, accepted in post graduate MSc. In 2007 I finished my MSc degree and start as Assistant Lecturer Teaching Practical Genetics, Practical Microbial Genetics, Practical Biology, Practical Zoology, and Practical Ecophysiology. In 2020, accepted in PhD degree in Molecular Genetics. From 2017 till now I am in charge in teaching Genetics theory for 4th class students. For 8 years (Between 2010-2016) and (2018-2020) I worked as a Member of the Examination Committee for College of Science.</p> <p><u>My experience:</u></p> <ul style="list-style-type: none"> • Assist. Lecturer in College of Science 2010. • Lecturer in College of Science 2014. • Rapporteur of Biology Department/ College of Science from September 2010 till 2016 and 2018 till 2020. • Member of editorial board of Zanco Journal of Pure and Applied Sciences/ Salahaddin University- Erbil from 2019-2020. • Member of National Ranking Committee of Salahaddin University- Erbil from 2019-2021 • Head of Biology Department February 2022 till now.
9. Keywords	Microbial Genetics, Genetic transfer in Bacteria, Regulation of gene expression in bacteria, Repair system, Genetic recombination in bacteria.
10. Course overview:	<p><u>Course description, objectives, and format</u></p> <p>Genetics is one of the basic science courses that comprise the Biology curriculum of the four years of Science College. The overall goal of these courses is to provide with the knowledge and understanding of the scientific principles that are the basis of current approaches to know the genetic basis of organisms. The application of these scientific principles and knowledge to the practice of science and diseases, including the development of life-long learning and problem-solving skills, is emphasized. The genetic course consists of 30 lectures (annually) and covers topics are integrated with the concurrent agriculture, medicine, statistics, microbiology, pathology, and integrated problems.</p> <p>Lectures from basic sciences, clinical disciplines and microbiology teach the fundamental principles of genetic and how these principles apply to the diagnosis and treatment of these problems in above fields.</p> <p><u>Course learning objectives</u></p> <p>By the end of this course, students will be able to apply their basis background in genetics to the practice of agriculture, scientific research, including the effective diagnosis, treatment and</p>

prevention of genetic disease. Detailed learning objectives are provided for each lecture.

11. Course objective:

Each lecture is accompanied by a power point presentation. Information from the presentation and assigned reading is important for mastering the learning objectives which are the primary focus of exam questions.

12. Assessment scheme

Examinations

There will be at least one obligate exam through the semester (10 marks), the exam will contain, short answer questions, long answer questions, make the diagram, etc. .

Quizzes and weekly assignments:

There will be at least 3 quizzes through the semester (5 marks), the practical exam has (35) marks, so the final grade will be based upon the following criteria:

Sum of exam and quizzes: 15%

Practical examination: 35%

Final examination: 50%

13. Student learning outcome:

At the end of your undergraduate teaching, you will be expected to be able to:

- Recognize the genetic and environmental contribution to multifactorial conditions.
- Be familiar with the microbial generics.
- To know the genetic recombination in bacteria.
- Be familiar with the repair systems.
- To know the genetic transfer in bacteria.
- Types of mutations, mutagens.
- To know some approaches of biotechnology and their applications.

14. Course Reading List and References:

1- Nester, M.T. (2001). Microbiology a human perspective (3rd ed.). Mc Graw Hill, U.S.A

2- Tortora, G.J.; Funke, B. R. and Case, Christine, L. (2004). Microbiology: an introduction (6th edi.). Pearson, Benjamin Cummings. U.S.A

3- Brooker, Robert J. (2005). Genetics (analysis and principles). Mc Graw Hill. U.S.A.

4-Pierce B.A. (2006). Genetics, A conceptual approach (2nd edi.). W.H. Freeman and Company. New York, U.S.A

15. The Topics:

Topics	Lectures
Introduction	Course outline, how to study Genetics, the role of genetics in life, distribution of marks, exams, and final exams
Microbial genetics, Types of mutation	Definition, What Are Mutations?, causes and types, Are mutations helpful or harmful?, single base-pair mutations, point mutation, substitutions, inversion, additions, Deletions, tautomeric shifts
Mutagenic agents and the mechanisms of mutation	Physical agents, ionizing and non-ionizing radiation, chemical agents, nitrous acid, hydroxylamine, base analogue mutagen, alkylating agents, acridines
Detection and isolation	(a) Plating the bacteria on antibiotic media, Visible Mutations, Auxotrophic Mutations, Conditional Mutations, Resistance Mutations, Using minimal media

of mutants	with sugars. (b) Using minimal media with sugars. Replica plating technique, Ames test
Repair of DNA	Photoreactivation repair, Base excision Repair, Nucleotide Excision Repair, Recombination repair, MisMatch Repair, SOS response, Double strand break repair
Regulation of gene expression, inducible operon	Definition, the operon system, genetic map of lactose operon, negative and positive control, Catabolite repression
Repressible operon	Definition, genetic map of tryptophan operon, Organization of the trp operon and regulation via the trp repressor protein, attenuation, Comparative properties of inducible and repressible operons
Genetic transfer & recombination in bacteria	Genetic recombination, homologous recombination, transformation, transduction, conjugation, conjugation in gram-positive bacteria
Introduction to cloning and recombinant DNA technology	DNA cloning, DNA sequencing, detection of disease genes, Polymerase chain reaction (PCR)
Application of recombinant DNA technology and gene therapy	(PCR basics, PCR in medicine, PCR in forensics), agricultural applications, transgenic mammals,
Continue to lecture	Medical applications, recombinant DNA vaccines, methods of gene therapy
Genetics of cancer	Cancer is a genetic disease, cell cycle regulation and cancer, predisposition to cancer, causes of cancer, cancer and environment

16. Examinations:

Q1) Draw the schematic diagram by which **2-amino purine** induced mutation.

Q2) Explain with figure the attenuation mechanism of controlling **trp operon**.

Q3) Explain with figure the tautomeric shift of **Guanine** and **Cytosine**.

Q4) Explain with figure the **Base excision Repair** system.