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A. General information about the course:

1. Course Identification:

1. Credit hours: (Lecture 2 + Lab 0)

2. Course type

A. ☐ University ☐ College ☐ Department ☒ Track

B. ☒ Required ☐ Elective

3. Level/year at which this course is offered: (Level 2 / first year)

4. Course General Description:

This graduate course focuses on the study of different types of inheritances. It exhibits the role of genes then chromosome formation within the nucleus of cells, which play a crucial role in facilitating appropriate cellular divisions and development to all living organisms, especially human beings. This knowledge flow provides an in-depth examination of the biological systems at the molecular level in both prokaryotic and eukaryotic organisms. This course is centered on Mendelian laws and extends after Mendelian theories. The topics covered in this course include monohybrid and dihybrid crosses (Mendelian Genetics); genetics for a single gene (with two alleles or more); quantitative genetics (polygenic inheritance); lethal alleles and related human diseases like favism and Huntington's disease; types of mutations; gene mapping; and population genetics principles. Types of mutations and related genetic diseases are also addressed.

5. Pre-requirements for this course (if any):

None

6. Co-requisites for this course (if any):

None

7. Course Main Objective(s):

The course intends to provide students with essential knowledge about genetic composition starting from the role of nucleic acids. Furthermore, it aims to provide students with a thorough comprehension of DNA packaging, chromatin formation, remolding chromatin, euchromatin and heterochromatin, and finally chromosome karyotyping. Moreover, it provides students with a thorough understanding of the fundamental principles of different types of inheritances in both prokaryotes and eukaryotes.



2. Teaching Mode: (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	• Traditional classroom	√	100%
2	E-learning	-	-
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours: (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	16
2.	Laboratory/Studio	-
3.	Field	-
4.	Tutorial	8
5.	Others (specify)	-
	Total	30

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods:

Code	Course Learning Outcomes	Code of CLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	List genetic vocabularies and the general concepts around it.	K1	-Lectures -Class participation	-Written examination -Class participation, -Assessment of assigned work
1.2	Outline Mendelian and non-Mendelian inheritance, and clarify Mendelian laws	K2	-Lectures -Class participation	-Written examination -Class participation,



Code	Course Learning Outcomes	Code of CLOs aligned with the program	Teaching Strategies	Assessment Methods
	when inheritance is related to more than two pairs of genes.			-Assessment of assigned work
1.3	Explain the genes conversions into chromatin fibers then finally into chromosomes.	K3	-Lectures -Class participation	-Written examination -Class participation, -Assessment of assigned work
2.0	Skills			
2.1	Summarize the fundamentals of population genetics, analyze mutations into gene and chromosomal mutations, and illustrate gene mapping.	S1	-Lectures -Class participation -Group discussions	-Presentations -Reports
2.3	Interpret how sexual reproduction produces genetic varieties and the differences between Sex chromosomes-linked traits and Sex-influenced traits	S2	-Lectures -Class participation -Group discussions	-Presentations -Reports
3.0	Values, autonomy, and responsibility			
3.1	Organize information from a variety of sources (textbooks, research papers and review articles), and use technology to prepare and process information	V1	-Class participation -Group discussions	-Presentations -Reports

Code	Course Learning Outcomes	Code of CLOs aligned with the program	Teaching Strategies	Assessment Methods
3.2	Demonstrate the ability to communicate scientific issues effectively both orally and in writing	V2	-Class participation -Group discussions	-Presentations -Reports
3.3	Show independence in performing assigned tasks and cooperate as an active member of a team	V3	-Class participation -Group discussions	-Presentations -Reports

C. Course Content:

No	List of Topics	Contact Hours
1.	Introduction Molecular Genetics and definitions of Genetic concepts	2
2.	Monohybrid and Dihybrid Crosses (Mendelian Genetics): -Alleles of Each Gene Segregate from Each Other During Gamete Formation -Alleles of Each Gene Segregate Independently of the Alleles of Other Genes	2
3.	Genetics for a Single Gene (with two alleles): Degrees of Dominance: Genetics for a Single Gene (more than two alleles (Multiple Alleles) Examples: human blood types(ABO grouping), coat color in rabbits	2
4.	Genetics for two or more genes : Types of Gene Interactions -Allelic/non-epistatic gene interaction -Non- Allelic/epistatic gene interaction -Complementary gene interaction	2
5.	Quantitative Genetics : Polygenic Inheritance: -In humans, height, weight, and skin color are examples of quantitative traits Lethal genes and their types: -Dominant lethal allele: ex. Huntington's-disease -Recessive lethal allele -Conditional lethal alleles: e.g. Fauvism	4
6.	DNA Packaging: -Bacteria Package DNA in Bacterial Chromosomes and Plasmids	4

	-Eukaryotes Package DNA in Chromatin and Chromosomes -Nucleosomes Are the Basic Unit of Chromatin Structure -Changes in Histones and Chromatin Remodeling Proteins Can Alter Chromatin Packing -Chromosomal DNA Contains Euchromatin and Heterochromatin -Chromosomes Can Be Identified by Unique Banding Patterns -Eukaryotic Chromosomes Contain Large Amounts of Repeated DNA Sequences	
7.	Chromosome theory of inheritance and Karyotyping: -Sexual Reproduction Produces Genetic Variety -Meiosis Generates Genetic Diversity Complete linkage – incomplete linkage – crossing over	2
8.	Sex inheritance and genetic diseases: Sex-linked characteristics in humans: -Colorblindness -Hemophilia -Short-sightedness -Muscle atrophy -Sex chromosomes-Linked traits and Sex-influenced traits	2
9.	Mutations: - Gene mutations - Chromosome mutations	2
10.	Population genetics and Gene Mapping	2
Total		30

D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Midterm exam-1	5 th week	20 %
2.	Midterm exam-2	10 th week	20%
3.	Quizzes, participation, reports, presentations, attendance	Throughout the course duration	20 %
4.	Final Exam	16 th week	40 %

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

E. Learning Resources and Facilities:

1. References and Learning Resources:

Essential References	-Bruce Alberts et al., Essential Cell Biology, Third edition, London, UK. (2009). ISBN-13: 978-0815341291. -Lodish, et al. Molecular Cell Biology. 5th ed. New York, NY: W.H. Freeman and Company, (2003). ISBN: 9780716743668. -Becker's WORLD OF THE CELL TENTH EDITION Jeff Hardin and James P. Lodolce(2022) -Robert F. Weaver. (2011) Molecular Biology, 5th Edition, McGraw-Hill Education. -Michael M. Cox, Jennifer Doudna, Michael O'Donnell. (2015) Molecular Biology: Principles and Practice, 2nd Edition, W. H. Freeman.
Supportive References	
Electronic Materials	
Other Learning Materials	

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom
Technology equipment (Projector, smart board, software)	Projector, Smartboard
Other equipment (Depending on the nature of the speciality)	

F. Assessment of Course Quality:

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Indirect
Effectiveness of students' assessment	Faculty	Direct
Quality of learning resources	Faculty	Direct
The extent to which CLOs have been achieved	Faculty	Direct
Other		

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

Assessment Methods (Direct, Indirect)

G. Specification Approval Data:

-	BIOLOGY DEPARTMENT COUNCIL
REFERENCE NO.	23
DATE	23/8/1445