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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 provides the students with the rigorous foundations in epigenetics. Epigenetics by definition is the study of how cells modulate gene activity without altering the DNA sequence, i.e. the factors beyond the genetic code. Epigenetic changes modify DNA in a way that regulates gene expression without changing the sequence of DNA building blocks. Epigenome implies all the modifications that regulate the activity (expression) of the genes. This course emphasizes diverse topics such as the various epigenetic mechanisms, how the epigenetic status of the genome is formed and maintained, and the role of epigenetic factors in gene regulation. The involvement of epigenetics in disease development and the modern approaches to assessing epigenetic changes of the genome are also focused.

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

None

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

None

7. Course Main Objective(s):

The objective of this course is to provide the students with a fundamental theoretical understanding of complex Epigenetic Phenomena. The course familiarizes the student with the current technology and drives principles of epigenetics. Among the course aims is to allow the students to identify the state-of-the-art experimental approaches in "Epigenetics and Chromatin Research".



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	30
2.	Laboratory/Studio	-
3.	Field	-
4.	Tutorial	-
5.	Others (specify)	
	Total	30

B. Course Learning Outcomes, Teaching Strategies, Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Distinguish inheritance from epigenetic genetic	K1	Two credits weekly lectures	-Quizzes -Presentations -Assignments

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	inheritance and the mechanisms of both.			-written exams
	List the various methods used to assess gene-specific and genome-wide epigenetic changes	K2	Two credits weekly lectures	Quizzes -Presentations -Assignments -written exams
1.2	Outline the structure and organization of chromatin and how it plays a role in epigenetic regulation	K3	Two credits weekly lectures	Quizzes -Presentations -Assignments -written exams
2.0	Skills			
2.1	Interpret and analyze the role of DNA methylation in epigenetic gene regulation	S1	-Two credits weekly lectures -Tutorials	-Presentations -Assignments -written exams
2.2	Relate between the epigenetic changes and various disorders that can result from these changes	S2	-Two credits weekly lectures -Tutorials	-Presentations -Assignments -written exams
2.3	Design a research study in epigenetics using critical thinking and the acquired skills	S3	-Two credits weekly lectures -Tutorials	-Presentations -Reports
3.0	Values, autonomy, and responsibility			
3.1	Show independence and responsibility and cooperate effectively in a team to carry out research work	V1	Group discussions	-Presentations -Reports
3.2	Discuss the scientific issues and present research results via oral presentations and in written format.	V2	Group discussions	-Presentations -Reports

C. Course Content:

No	List of Topics	Contact Hours
1.	Fundamental principles about epigenetics: - Epigenetics as a new frontier in biology - Genetics to epigenetics - The Epigenome	4
2.	The mechanisms and molecules that regulate epigenetic processes: - Chromatin modifications - DNA methylation and non-coding RNAs - Dynamic organization of the genome and epigenetic processes	4
3.	Epigenetic phenomena in different animal model organisms: - X chromosome inactivation in Mammals - Transgenerational epigenetic inheritance in animals	3
4.	How can epigenetics influence the life of an organism? - Inheritance of chromatin modifications - Epigenetic reprogramming and genomic imprinting - Epigenetic and cell differentiation - Epigenetic variations in human populations	4
5.	Environmental epigenetics: - Nutrition drives heritable epigenetic changes - Epigenetic inheritance of environmental stresses - Epigenetic control of selfish elements during environmental changes	3
6.	Epigenetic mechanisms in diseases: - Epigenetics and aging - Epigenetic mechanisms in metabolic diseases - Epigenetic in cancer - Therapeutic epigenetic approaches to cancer	4
7.	Future perspective: - New frontiers of epigenetic research - Epigenetic discoveries for human society	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.	Assignments, presentations, attendance, data search, participation	Throughout the course duration	20%
4.	Final exam	16 ^h 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	-Benjamin A Pierce. (2020). Genetics: a conceptual approach. 7 th edition W.H. Freeman. ISBN-13-978-1319216801.
Supportive References	https://www.kaust.edu.sa
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, smart board
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

Assessment Areas/Issues	Assessor	Assessment Methods
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)

عبدالمطعم بن عبدالمعز بن يوسف بن عبد الله بن حمد بن الناصر

G. Specification Approval Data:

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

عبدالمطعم بن عبدالمعز بن يوسف بن عبد الله بن حمد بن الناصر

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