هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA

2024
TP-154

Course Report
(Bachelor)

Course Title:	**Evolutionary and Ecological Genetics**
Course Code:	**EVS 1020**
Program:	**Environmental Science**
Department:	**Biology**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**1**
Last Revision Date:	-

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A. General information about the course:

1. Course Identification

1. Credit hours: 2 (2 Lectures + 0 Lab)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☐ Required		☒ Elective		
3. Level/year at which this course is offered: (Not determined)					
4. Course General Description:					
The course encompasses several aspects of evolutionary and ecological genetics focusing on case studies and data analysis. The course emphasizes the link between molecular and phenotypic analyses in the study of evolutionary processes in natural populations. A special focus is also made on linking evolutionary and ecological processes.					
5. Pre-requirements for this course (if any)**:**					
EVS 1111					
6. Co-requisites for this course (if any)**:**					
None					
7. Course Main Objective(s):					
The objective of this course is to provide an integrated view, combining theoretical and experimental approaches to the study of evolution with a consideration of both pure and applied aspects of evolutionary change. There is a strong emphasis on the development of numerical skills needed for the analysis and interpretation of genetic data and a quantitative approach to the study of evolution.					

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**	0
4.	**Tutorial**	0
5.	**Others (specify)**	0
Total		30

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

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**Discuss genetic mechanisms underlying evolutionary processes**	K1	Course lectures	Quiz Midterms Final Exam
1.2	**Outline general principles in population genetics and quantitative genetics**	K2	Course lectures	Quiz Midterm Final Exam
1.3	**Identify the basic theories of phenotypic selection and adaptive evolution**	K3	Course lectures	Quiz Midterm Final Exam
1.4	**Explain how ecological and evolutionary processes interact and affect short-**	K4	Course lectures	Quiz Midterm Final Exam

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	and long-term population viability.			
2.0	Skills			
2.1	**Use genetic data to estimate population genetic parameters and determine relatedness and individual fitness**	S1	Course lectures	Quiz Midterm Final Exam
2.2	**Estimate strength and direction of phenotypic selection and predict rate of evolution - Analyze relatedness and molecular genetic data to determine the genetic basis for ecologically important phenotypic traits**	S2	Course lectures	Lab Midterm Final Exam
2.3	**Evaluate critically, interpret and judge results from studies at the intersection of evolution, genetics and ecology**	S3	Course lectures	Lab Midterm Final Exam
2.4	**Plan studies in evolutionary and ecological genetics.**	S4	Course lectures	Lab Midterm Final Exam
3.0	Values, autonomy, and responsibility			
3.1	**Evaluate the importance of genetic and ecological processes for evolution in natural populations**	V1	Discussion	Performance Evaluation
3.2	**Judge and reflect on primary literature in evolutionary and ecological genetics**	V2	Discussion	Performance Evaluation
3.3	**Show the ability to present results from quantitative studies through different modes**	V3	Discussion	Performance Evaluation

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
3.4	**Demonstrate the ability to work independently and cooperate with team.**	V4	Discussion	Performance Evaluation

C. Course Content

No	List of Topics	Contact Hours
1.	**Foundations:** Introduction to Population Genetics, elements of population genetics, Genetic variation, Characterization of DNA sequence variations, Gene Pool of a Population (Allelic frequencies, phenotypic frequencies, genotypic frequencies)	**8**
2.	**Hardy-Weinberg Law** Genotypic Frequencies at Hardy–Weinberg Equilibrium Closer Examination of the Assumptions of the Hardy–Weinberg Law Implications of the Hardy–Weinberg Law Extensions of the Hardy–Weinberg Law Testing for Hardy–Weinberg Proportions Estimating Allelic Frequencies with the Hardy–Weinberg Law	**8**
3.	**Genetic Variation in Populations and their Analysis** Nonrandom Mating Evolutionary Forces: mutations, genetic recombination, gene flow or gene migration, genetic drift, natural selection,	**4**
4.	**Evolutionary Genetics** Natural Populations and Genetic Variation New Species and Reproductive Isolation Evolutionary History and Homologous Characteristics Patterns of Evolution Evolution of Sex Multi-locus evolution: Adaptive landscape, Spatial variation, Temporal variation	**2**
5.	**Quantitative Genetics** Quantitative Characteristics Variation Quantitative Characteristics and Statistical Methods Heritability and Genetic variation Genetically Variable Traits and Selection	**2**
6.	**Ecological genetics** Inbreeding depression and mating systems: Evolution of selfing rate, Modifier models, Breeding system evolution	**2**
7.	**Population substructure** F statistics. migration Hierarchical F, derived from coalescent theory Likelihood, Bayesian statistics	**4**
Total		**30**

No	List of Topics (labs)	Contact Hours
1.	**Gene Pool of a Population** (Allelic frequencies, phenotypic frequencies, genotypic frequencies)	**4**
2.	**Hardy-Weinberg Law**	**4**
3.	**Genetic Variation in Populations and their Analysis**	**4**
4.	**Evolutionary Genetics:** The Alignment of Homologous Sequences The Construction of Phylogenetic Trees	**4**
5.	**Quantitative Genetics** Measuring natural selection G-matrix QTL simplified Heritability and Genetic variation	**4**
6.	**Population substructure** F statistics. migration Hierarchical F, derived from coalescent theory Likelihood, Bayesian statistics	**4**
Total		**24**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Midterm exam 1	5th week	20%
2.	Midterm exam 2	10th week	20%
3.	Quizzes, Participation, Attendance	During the semester	20%
6.	Final Exam	15th week	40%
Total			**100%**

*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. 7th edition W.H. Freeman. ISBN-13-978-1319216801.
Supportive References	
Electronic Materials	• Saudi Digital Library https://www.sdl.edu.sa/SDLPortal/Publishers.aspx http://www.animalbehavior.com
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms and Laboratories
Technology equipment (projector, smart board, software)	Projector and Smartboard
Other equipment (depending on the nature of the speciality)	Genetics-related equipment

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Direct
Effectiveness of Students assessment	Program Leader	Direct
Quality of learning resources	Peer Reviewer	Indirect
The extent to which CLOs have been achieved	Program Leader	Direct
Other	-	-

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**Biology Department Council**
REFERENCE NO.	**2**
DATE	**21/02/1446 H**