The University of Jordan

Accreditation & Quality Assurance Center

COURSE Syllabus

1	Course title	**Evolution**
2	Course number	**0304465**
3	**Credit hours (theory, practical)**	**3,0**
	Contact hours (theory, practical)	**3 hours weekly**
4	Prerequisites/corequisites	**Department approval**
5	Program title	**B.Sc. in Biological Sciences**
6	Program code	**04**
7	Awarding institution	**University of Jordan**
8	Faculty	**Faculty of Sciences**
9	Department	**Department of Biological Sciences**
10	Level of course	**Senior (4th year)**
11	Year of study and semester (s)	**Offered in the Fall and Spring Semesters of the academic year**
12	Final Qualification	
13	Other department (s) involved in teaching the course	**None**
14	Language of Instruction	**English**
15	Date of production/revision	**January 19, 2016**

16. Course Coordinator:

Dr. Waleed Gharaibeh
Rm. 110 Biology Building
Office hours: 11:00-12:00 Sunday, Monday, Wednesday
Ext. 22205
waleed.gharaibeh@ju.edu.jo

17. Other instructors:

NA

18. Course Description:

This course will introduce students to the evolutionary theory as the unifying principle in modern biology. It will open with a short overview of the philosophy of science in order to dispel misconceptions and fears often associated with this theory. Next, the historical context within which C. Darwin formulated his ideas is outlined and various lines of evidence in support of this theory are presented. Subsequently, evolution as a process and pattern is examined in light of current biological knowledge including the following topics: the mechanisms and modalities of natural selection, genetic drift and gene flow as evolutionary forces and their consequences for Hardy-Weinberg equilibrium; various models for speciation and the mode and tempo of evolutionary change; phylogenetic reconstruction and evolutionary developmental genetics. Finally, the critical significance of evolutionary theory in various practical fields such as medicine, agriculture and conservation genetics is demonstrated using concrete and up-to-date examples.

19. Course aims and outcomes:

A- Aims:

By the end of the class the students are expected to learn the following:

1. **The position of evolution as the fundamental theoretical foundation of biology.**
2. **How the theory of evolution provides a most elegant and well-supported explanation for the unity, diversity and adaptability of living forms.**
3. **The predictive power of the evolutionary theory.**
4. **The modalities and mechanisms of evolution as a process.**
5. **The tree-like pattern of interrelationships between taxa and hierarchical nesting of biological grouping which reflects descent with modification.**

B- Intended Learning Outcomes (ILOs):

Successful completion of the course should lead to the following outcomes:

A. Knowledge and Understanding Skills: The students are expected to

A1- Describe the importance of the evolutionary theory as the overarching theme of biology.
A2- Locate the development of Darwin's ideas within the context of 19th century Western thought.
A3- Explain the mechanism of natural selection.
A4- Define evolution at the population and phyletic levels.
A5- List the most common misconceptions about evolution and natural selection.
A6-. Illustrate the various lines of evidence in support of evolutionary theory using examples.
A7- Describe the relationship between genetic variation and the potential for adaptation.
A8- List the various prezygotic and postzygotic isolation mechanisms.

B. Intellectual Analytical and Cognitive Skills: The students are expected to

B1- Compare between the various mechanisms of evolutionary change in terms of operation conditions and consequences.
B2- Distinguish between sympatric and allopatric speciation.
B3- Contrast punctuated equilibrium with gradualist models for the mode and tempo of evolution.

C. Subject- Specific Skills: The students are expected to

C1- Calculate observed allele frequencies and expected Hardy-Weinberg frequencies.
C2- Identify monophyletic and paraphyletic groups in a phylogenetic sketch.
C3- Map characters on a phylogeny and recognize homologous and analogous characters.

D. Creativity /Transferable Key Skills/Evaluation: The students are expected to

D1- Critique creationist arguments in their various formulations.
D2- Evaluate the relevance of evolutionary theory to important current issues including drug resistance, emergence of new viral diseases, monoculture farming, conservation of biodiversity, global warming, forensics and eugenics.

20. Topic Outline and Schedule:

Content	Week	ILO	Evaluation Methods	References
Introduction to the course; Philosophy of science: the demarcation problem; observation; experiment; hypothesis; theory; induction; hypothetico-deductive method; analytical method; reductionism; materialism; parsimony	1 & 2	A1-A2, D1	Discussion, assignments & exams	Campbell, chap 1 Pigliucci, chap 4 Recommended: Futuyma, chap 22
Evolutionary theory: *Scala Naturae*; Linnaeus; Lamarck; uniformitarianism; Malthus; descent with modification; natural selection; the modern synthesis	3 & 4	A1-A6, C2-C3, D1	Discussion, assignments & exams	Campbell, chap 22 Mayr, 1994 Rediscovering Biology, Unit 3: Evolution and Phylogenetics Recommended: Futuyma, chap 1
Population genetics: genetic variation; Hardy-Weinberg; genetic drift; gene flow; natural selection; adaptation; sexual selection	5 & 6	A3, A4, A7, B1, C1, D2	Quiz, discussion, assignments & exams	Campbell, chap 23 & section 51.4 Gould & Lewontin, 1979 Recommended: Futuyma, chap 9, 10, 11 & 12
Speciation: reproductive isolation; allopatric speciation; sympatric speciation; hybrid zones; mode and tempo of evolution; macroevolution	7 & 8	A4, A8, B2, B3,	Discussion, assignments & exams	Campbell, chap 24 Recommended: Futuyma, chap 15 & 16
Paleontology: fossils; fossil dating; Key events: chemical evolution; prokaryotes; photosynthesis; aerobic respiration; eukaryotes; endosymbiosis; multicellularity; Cambrian explosion; colonization of land; adaptive radiation; vertebrate evolution; mass extinctions; human evolution; orthogenesis	9 & 10	A4, A6, B3, C2-C3, D1-D2	Discussion, assignments & exams	Campbell, chap 25 (minus 25.5) Recommended: Futuyma, chap 4, 5, 6 & 7 Rediscovering Biology, Unit 9: Human Evolution
Evolutionary development and genome evolution	11 & 12	A4, A6-A7, B2-B3, D1-D2	Discussion, assignments & exams	Campbell, section 25.5 What Darwin Never Knew

				Rediscovering Biology, Unit 7: Genetics of Development Recommended: Futuyma, chap 20
Phylogeny and taxonomy	13 & 14	A1, A5-A6, C2-C3, D1-D2	Discussion, assignments & exams	Campbell, chap 26 Rediscovering Biology, Unit 3: Evolution and Phylogenetics Recommended: Futuyma, chap 2
Kin selection: altruism; inclusive fitness; social learning	15	A1, A3, A5, D2	Discussion, assignments & exams	Campbell, chap 51, section 51.5 Recommended: Futuyma, chap 14

21. Teaching Methods and Assignments:

Lectures, discussion, guest speakers, films, animation, homework and assignments.

22. Evaluation Methods and Course Requirements:

Exams, quizzes, discussion and assignments.

23. Course Policies:

All students are expected to adhere to the rules of conduct outlined in the University of Jordan Student Handbook.

http://studentaffairs.ju.edu.jo/Pages/PDFGuidestudent.aspx

A- Attendance policies:

Enrolled students are expected to attend the lectures in line with the university of Jordan policy as outlined in the UJ student handbook. Failure to do so will make the student subject to the penalties outlined in the said document. Furthermore, missing classes will have negative repercussions on the student's participation grade.

B- Absences from exams and handing in assignments on time:

You should talk to your instructor as soon as possible if you miss an exam. All such cases will be dealt with according to the UJ student handbook rules.

C- Health and safety procedures:

NA

D- Honesty policy regarding cheating, plagiarism, misbehavior:

All violations pertaining to cheating, plagiarism and misbehavior will be dealt with in accordance to the rules outlined in the UJ student handbook.

In order to avoid plagiarism, the sources for the information contained in your homework must be properly cited and verbatim quotations must be limited and explicitly presented as such.

To learn more about the procedures for ethical referencing of information and how to assess the credibility of information critically you can consult with the relevant documents in the course UJ e-learning page (see below).

You can use any standard citation style (*e.g.,* Chicago or MLA), but in biological sciences we prefer AMA.

E- Grading policy:

Evaluation	Point %	Date
Midterm Exam	30%	Wednesday, March 18, 2015
Assignments, Homework and Participation	10%	
Final Exam	60%	TBA

F- Available university services that support achievement in the course:

Moodle course page at University of Jordan e-learning portal: https://elearning.ju.edu.jo/

24. Required equipment:

None

25. References:

A- Required book (s), assigned reading and audio-visuals:

Textbooks:

1. Futuyma, D.J. 2009. Evolution. 2nd ed. Sinauer Associates.
2. Campbell, N.A., Reece J.B., *et al*. 2008. Biology, 2nd ed. Pearson.

Additional References:

1. Gould, S. J. and Lewontin, R. C. 1979. The spandrels of San Marco and the Panglossian paradigm: a critique of the adaptationist programme, Proceedings Of The Royal Society of London, Series B, Vol. 205, No. 1161 (1979), Pp. 581-598.
2. Mayr, E. 1994. Typological versus population thinking. In Sober, E. (ed.) Conceptual issues in evolutionary biology. The MIT Press.
3. Pigliucci, M. 2002. Denying evolution: creationism, scientism, and the nature of science. Sinauer Associates.
4. Sober, E. 1994. (ed.) Conceptual issues in evolutionary biology. The MIT Press.

E-sources and audiovisuals

1. Rediscovering Biology: Molecular to global perspectives: http://www.learner.org/courses/biology/index.html
2. UC Berkeley's Understanding Evolution webpage: http://evolution.berkeley.edu/
3. PBS's evolution library: http://www.pbs.org/wgbh/evolution/library/index.html
4. What Darwin Never Knew (Nova documentary, 2010)

26. Additional information:

Name of Course Coordinator: الدكتور وليد غرايبة Signature: ---------- Date: 12/ 01/ 2016

Head of curriculum committee/Department: الاستاذة الدكتورة سوسن العوران Signature: ----------

Head of Department: الدكتورة هناء العبوس Signature: ----------

Head of curriculum committee/Faculty: الاستاذة الدكتورة أمل العابودي Signature: ----------

Dean: الاستاذ الدكتور صالح محمود Signature: ----------

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Assistant Dean for Quality Assurance
Course File