

## **EEES 2150-001 (FALL 2015) – BIODIVERSITY (4 credits)**

### **Diversity of Life, Evolution, and Ecology**

Time and Place: MTWR 2:00-2:50 pm, Rocket Hall 1520  
Professor: Dr. Hans Gottgens, BO-3007B (530-8451)  
E-mail: johan.gottgens@utoledo.edu  
Website: <http://www.utoledo.edu/nsm/envsciences/faculty/gottgens.html>  
Office Hours: MTR 3:20-5:00pm, or by appointment  
Teaching Assistant: Breanna Caton, BO-2001, Breanna.Caton@utoledo.edu. Office hours and help desk: R 4:40pm-7:10pm, F 11am-1:30pm, or by appointment.  
Review sessions: R 7:20-8:20pm in RH 1520.

#### **Course Description:**

This course serves as an introduction to the basic principles of biological evolution, diversity, and ecology. It begins with a discussion of the characteristics of living organisms, the hierarchical structure of biology and its major organizing concepts. It briefly examines chromosomes, cell division, and the concept of heredity in order to understand the mechanisms of evolution and speciation. Biological diversity is emphasized in the context of evolution, rather than as a 'parade of kingdoms'. Throughout the course, the structure of ecosystems, and concepts of population and community ecology are examined.

This course counts towards fulfilling the natural science competency requirements of our general education curriculum. It is designed to expose students to the process of scientific inquiry and to encourage development of a perspective of science in the world. It concentrates on providing an understanding of the basic issues, methods and theories that drive scientific inquiry. Because of the large number of pre-nursing majors in this course, many case studies and applications used in class will have links with the discipline of health sciences.

In order to qualify for the general education/core curriculum in natural science, this course:

- a. provides an understanding of the nature of science in general and of major scientific concepts
- b. provides analysis and evaluation of scientific information
- c. provides discipline specific principles and information
- d. presents applications and demonstrate the value of the discipline to society in general
- e. introduces scientific reasoning skills

#### **Course web site:**

BlackBoard will host the course syllabus, schedule, presentation files, readings, assignments, evaluation policies, and grades. I will also post links to the textbook, summaries of important concepts, lists with key terms for each exam, recommended readings, web explorations, example test questions, glossaries, information about jobs and internships, and extra credit readings (see below). You can check on all your grades during the term with your regular UTAD UserID and password.

#### **Requirements and evaluation:**

It is your responsibility to attend every scheduled class meeting and to read the material before it is presented in the lectures. I will never take roll. All key points will be covered in lecture and your presence at each class meeting will greatly impact your grade. Active participation in class is, of course, encouraged and I expect your full attention. In spite of the class size, I encourage you to ask questions during class.

Please minimize late arrivals and early departures! It is your responsibility to get the notes if you miss lecture. I do not give out notes to be copied but would be happy to go over the material with you during

office hours. When you come to office hours, both my TA and I expect you to bring your class notes with you. We can help you better if we see what you take away from the lectures and record during class.

Grades will be based on three midterms (each 25%, but only two midterms count), a final exam (30%) and ten *MasteringBiology* (*MB*) homework assignments (20%). With a class this size, there will be no make-ups for any of the three midterms. Instead, the lowest grade among the first three midterms will be dropped. Among others, this will help avoid persistent problems with make-up exams. The final exam is required of all students. In addition, I will actually assign eleven homework assignments from *MB* and the lowest grade will be dropped (only 10 assignments count). Grade distributions for the midterms and the final exam may be curved. The grading scale is A (91% and above), B (81-90%), C (71-80%), D (61-70%) and F (60% and below). "+" and "-" grades are given at the fringes of these categories. In other words, an A- is given for grades between 90 and 91% and a B+ is assigned for grades between 89 and 90%, etc.

All exams will be objective, i.e., multiple choice/computer-graded (bring #2 pencil to each exam). Only a few of these questions will deal with memorization (selecting an answer that was presented in the same form in class). The large majority of the questions will focus on interpretation (recognizing relationships within some body of information), extrapolation (extending what you have learned in class to determine its implications or consequences), and synthesis (creating something new out of what you already know). Material for the exams will come from the lectures and assigned readings.

In addition, four unannounced pop quizzes (no make-ups!) will be scattered throughout the term. These quizzes, given at the start of class, cover material from some of the 'classic' papers in biology and count for extra credit (up to 10% additional points). All papers are available on the course web site.

Our first paper will be Watson and Crick's seminal article on the structure of DNA (*Nature*, 1953, Vol. 171, 737-738). The second paper is Robert Whittaker's "New Concepts of Kingdoms of Organisms" (1969, *Science* 163: 150-160) and our third paper is David Tilman's 2000 article on "Causes, consequences and ethics of biodiversity." (*Nature* 405: 208-211). The final paper of the semester covers biodiversity hotspots for conservation priorities (Myers *et al.* 2000. *Nature* 403, 853-858).

Please pay attention to the deadline for withdrawal from the course (in order to receive a "W" grade). Unless a student withdraws him/herself by this date, he/she will remain enrolled in the class and will be graded. "I" grades are only given in extraordinary cases when unexpected conditions prevent the student from completing the requirements of the course within the term of enrollment.

### **Required reference:**

Reece, J.B. et al. 2014. Campbell Biology (10th ed.). Pearson Learning, San Francisco. (ISBN-13: 978-0-321-77565-8) including access to *MasteringBiology* (*MB*). Rather than this full textbook edition, the smaller custom edition for the University of Toledo (based on 10<sup>th</sup> ed.) is fine too. This book is not inexpensive and you may want to purchase a used and older version of either the full text or the UT custom edition. Don't go further back than the 9<sup>th</sup> edition. You will also need access to *MB*. Because of the access code, *MB* needs to be purchased new. Used versions will not work. In short, the least expensive option may be to get this program directly from the *MB* website and to buy a 9<sup>th</sup> edition text somewhere else. For those of you who really do not want to buy a book at all, I will place a copy of the text on reserve in Carlson Library (in-house reading only; 2 hours max).

You are asked to read each assignment before it is covered in class. The book, however, is not a replacement for the lectures, which are primary for exams. In preparing for the exams, you should emphasize the keywords and concepts listed in your textbook. To help you with this, I will provide additional lists with keywords and concepts during the term.

### **Academic Honesty and University Policies:**

Students are expected to strictly adhere to principles of academic honesty in all aspects of this course, in accordance with policies presented in The Student Handbook and at <http://www.utoledo.edu/dl/students/dishonesty.html>. During exams and quizzes, cell phones must be turned off and packed away (cell phones may be on 'silent mode' during lectures). Infractions may result in a failing grade for the course.

The University is an equal opportunity educational institution. Please read the policy statement on non-discrimination on the basis of disability - Americans with Disabilities Act compliance available at [www.utoledo.edu/policies/administration/diversity/pdfs/3364\\_50\\_03\\_Nondiscrimination\\_o.pdf](http://www.utoledo.edu/policies/administration/diversity/pdfs/3364_50_03_Nondiscrimination_o.pdf).

The University of Toledo is committed to providing equal access to education for all students. If you have a documented disability or you believe you have a disability and would like information regarding academic accommodations/adjustments in this course please contact the Student Disability Services Office (<http://www.utoledo.edu/offices/student-disability-services/>).

### **Instructor:**

Dr. Gottgens is professor and associate chair in the Department of Environmental Sciences. Other than this course, he teaches conservation biology (+lab), aquatic ecology (+lab), tropical biology and the senior capstone course. His research concentrates on aquatic ecology (<http://www.utoledo.edu/nsm/envsciences/faculty/gottgens.html>). Over the years, this field has grown from a basic science to an applied discipline which is increasingly called upon to help understand and solve pollution problems impacting our water resources. As a result, modern aquatic ecology combines traditional biology with engineering, hydrology, geology, chemistry, and other disciplines. Training, required for successful employment in this field, stresses such a modern approach to ecology. Dr. Gottgens also serves as editor in chief for the international peer-reviewed journal *Wetlands Ecology and Management*.

**BIODIVERSITY - EEES 2150-001- Gottgens: Fall 2015**

Week	Dates	Topics	Reading Chapters*
		<b>Introduction and the science of biology</b>	
1	Aug 24-27	Characteristics of living organisms, biological hierarchy, organizing concepts, themes in the study of life. Size/time scales. A tour of the cell	1 6 (concepts 1, 2 and 3 only)
		<b>Chromosomes, cell divisions, and genes</b>	
2	Aug 31- Sep 3	How do cells create new cells? Cell cycle and mitosis. Chromosomes, heredity, meiosis, variation.	12 (concepts 1 and 2 only), 13
3	Sep 8-10	<i>September 7 – Labor Day (no class)</i> . Mendel and the gene idea; from peas to humans. DNA as the genetic material. The molecular basis of inheritance.	14, 15 (concepts 1 and 4 only), 16
4	<b>Sep 14</b>	<b>First exam</b>	
		<b>Evolution</b>	
4	Sep 15-17	Viruses: Formidable pathogens	19
5	Sep 21-24	Evolutionary biology. Darwin and descent with modification. Natural selection, genetic drift and gene flow.	22
6	Sep 28- Oct 1	Macro-evolution; the origin of species. Why aren't we perfect after all this evolution?	23, 24
7	Oct 7-8	<i>October 5-6 – Fall Break (no class)</i> . Chemical evolution and the history of life. The fossil record.	25
8	<b>Oct 12</b>	<b>Second exam</b>	
		<b>The evolution of diversity</b>	
8	Oct 13-15	Phylogeny, systematics and the Tree of Life	26
9	Oct 29-22	Prokaryotes diversity and ecological impact	27
10	Oct 26-29	The origin of eukaryotic diversity - Protists.	28
11	Nov 2-5	Fungi - diversity and ecological impact.	31
12	<b>Nov 9</b>	<b>Third Exam</b>	
		<b>Diversity (plants, fungi and fauna) and ecology</b>	
12	Nov 10, 12	Plant evolution; adapting to life on land. <i>November 11 – Veteran's Day (no class)</i>	29
13	Nov 16-19	Vascular plants with and without flowers.	30
14	Nov 23, 24	Animal evolution. Phylogeny and diversity. Invertebrates. <i>November 25-27 – Thanksgiving (no class)</i>	32, 33
15	Nov 30- Dec 3	Vertebrates – half a billion years of backbones	34
16	Dec 7-10	The scope of ecology. Energy and nutrients flows. Ecological interactions, biocomplexity, communities and ecosystems.	52
17	<b>Dec 17</b>	<b>Final Exam (12:30 – 2:30pm)</b>	

\* Reece, J.B. et al. 2014. *Campbell Biology (or the UT Custom Edition, based on 10<sup>th</sup> Ed.)*. Pearson Learning Solutions, CA

**Reading assignments may change during the semester.**