

BIO303: PHYSIOLOGY
SPRING 2020 SYLLABUS
Tuesday/Thursday 12:30-1:50, Knox 14

INSTRUCTOR: Dr. Meredith Ezak

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COURSE DESCRIPTION AND OBJECTIVES: BIO 303 Physiology is a 3-credit hour course designed to follow the first-year major curriculum in Biological Sciences (BIO 200 Evolutionary Biology, and BIO 201 Cell Biology). The course presents basic principles of physiology, with in-class examples and assignments building upon foundational knowledge of the diversity of life and its evolutionary history, including the challenges of life in changing and extreme habitats, and upon solid understanding of cell structure and function, including energetics. An integrative and systems approach will be utilized, with the units of focus being the tissue and organism. The major systems topics for study will include (but not necessarily be completely defined by): barrier membranes, excitable tissues (nervous and sensory systems, and muscle), mechanics and locomotion, energetics and digestion, circulation and respiration, homeostasis (water, salt and nitrogen balance, and thermoregulation), chemical integration (endocrine and immune systems), reproduction, and environmental and conservation physiology. This course also has a substantial quantitative physico-chemical slant to it that reflects the field of physiology. Your background coursework in algebra and calculus will be more than sufficient to arm you with the necessary quantitative analytical skills needed in this course.

PREREQUISITES: Students should have sophomore-level or higher academic class status, have successfully completed the first-year introductory course sequence for majors (BIO 200 Evolutionary Biology and BIO 201 Cell Biology) or equivalent coursework, and be in good academic standing.

COURSE MATERIALS:

- **Sadava *et al.*, *Life: The Science of Biology*, 11th edition.** This single required textbook is the same text that was used in BIO 200 and BIO 201. If you already own the book, that's great, use it again in this Spring 2020 Semester. If you do not own the book, it is available new or used for your purchase at the University Bookstore on the North Campus, and from on-line booksellers. If you own the 10th edition from an earlier taking of BIO 200, this is fine, too. In the case of using the 10th edition, please use the chapter conversion table that is posted on UBLearns to make the necessary adjustments in the assigned readings.
- **iClicker Reef mobile app.** Instructions to register are provided on UBLearns.
- Occasional supplemental readings and/or worksheet materials announced in class and made available through UBLearns.

PROGRAM LEARNING OBJECTIVES: In the context of departmental program learning objectives, this course will, for the student:

- provide a breadth of knowledge of basic principles and concepts;
- provide depth within specialized areas;
- develop approaches for integration of information;
- encourage critical thinking and hypothesis building;
- provide skills in scientific communication;
- provide contemporary information; and
- encourage an appreciation of scientific values.

COURSE LEARNING OBJECTIVES: In the specific context of course learning objectives, students successfully completing this course will:

- ¹appreciate the functional organization of complex metazoans and the importance of specialized tissues and physiological systems in large organisms;
- ²understand the principles of organismal homeostasis and acclimation, and regulation by feedback loops and other mechanisms;
- ³recognize the importance of cellular processes underlying physiological acclimation, and of evolutionary adaptation to environment;
- ⁴master basic quantitative skills that are important for analyzing, understanding and presenting physiological data; and
- ⁵be prepared academically for upper-division elective coursework in neurobiology, endocrinology, immunology, and other fields.

ASSESSMENT: Student achievement of course learning objectives will be assessed formally by:

- four in-classroom quizzes of multiple-choice questions, for testing knowledge acquisition (course learning objectives 1-3)
- three in-classroom exams of combined multiple-choice and short-answer/calculation questions, for testing knowledge acquisition (course learning objectives 1-3) and quantitative skills mastery (course learning objective 4);
- a comprehensive in-classroom final exam of combined multiple-choice and free-response questions, for measuring knowledge acquisition (course learning objectives 1-3), quantitative skills mastery (course learning objective 4), and preparation for advanced-level coursework (course learning objective 5).

PARTICIPATION: Class participation is encouraged throughout the semester using the iClicker Reef app and a method known as Peer Instruction. Lectures will be interspersed with multiple-choice conceptual questions designed to expose common difficulties in understanding the material. These questions provide valuable feedback for the instructor, but also an opportunity for students to assess their own learning. Questions will be answered through iClicker Reef with the overall student response dictating how class proceeds: either moving on to the next topic if >80% of the class answered correctly; discussing the question with a peer, before the question is posed again, if ~50-75% of the class answered correctly; or revisiting the concept again if <~50% of the class answered correctly. While these questions are not graded, active student engagement and participation in these discussion and question-and-answer periods will

promote deeper comprehension and learning. Skill-building worksheets will also be available for download at UBLearn. These no-credit exercises can be completed by interested students to assess their understanding of course material, and their preparation for short-answer/calculation exam questions.

COURSE REQUIREMENTS AND

GRADING: This course is organized into four sections, with a quiz halfway through each section, and an exam at the conclusion of each section. Course grades will be determined by the following scheme:

- **Quizzes 1-4** will be given around the midpoint of each unit. They will consist of multiple-choice questions and require iClicker reef to record answers. They are not cumulative in nature. These quizzes are intended to ensure students are keeping up with the material in each section, and not waiting until just prior to an exam to review notes and assess their understanding of the content.
- **Exams 1, 2 and 3** will focus on materials from defined sections of lectures. The **Final Exam** will emphasize material from the final section of lectures but will additionally and necessarily include questions and components of questions that are comprehensive, cumulative, and/or review in nature.
- All four exams and quizzes must be completed in order to pass this course.
- Final course grades will be based on total exam point accumulation by each student, according to the following scheme:
- Each student’s accomplishment, both overall and on the several contributors to total point score, will be evaluated during final course grade assignment.
- *Note: In addition to graded quizzes, iClicker Reef is used in class for ungraded poll questions to assess your understanding of the material, and to encourage active participation in lecture. The grade you will see in iClicker Reef for ungraded poll questions is not associated with your overall grade in the course.*

ASSESSMENTS AND GRADING		
Section 1	Quiz 1	10 points
	Exam 1	90 points
Section 2	Quiz 2	10 points
	Exam 2	90 points
Section 3	Quiz 3	10 points
	Exam 3	90 points
Section 4	Quiz 4	10 points
	Final Exam	90 points
Total points:		400 points

FINAL COURSE GRADES	
A	368-400 pts (92-100%)
A-	352 - 367 pts (88-91%)
B+	336 - 351 pts (84-87%)
B	320 - 335 pts (80-83%)
B-	304 - 319 pts (76-79%)
C+	288 - 303 pts (72-75%)
C	272 - 287 pts (68-71%)
C-	256 - 271 pts (64-67%)
D+	236 - 255 pts (59-63%)
D	220 - 235 pts (55-58%)
F	<220 pts (<55%)

ATTENDANCE: Perfect lecture attendance by each registered student is expected. This expectation of regular attendance is intended to promote both individual student and overall class learning. For valid planned and/or expected absences from a quiz/exam (academic program interviews, scheduled medical procedures, university representational activities, etc.), you must contact the instructor a minimum of one week prior to the exam/quiz to provide documentation and arrange to complete the assignment BEFORE the rest of the class.

Unplanned, documented medical and other legitimate, urgent absences from quizzes/exams will be excused with proration of quiz/exam points. Any student absent without notice from a quiz or exam and without a physician's written note of excuse or other documentation of urgency will receive a zero for that assignment.

Incomplete "I" grades will be assigned only in accordance with University policy. The University has a specific and well-defined policy regarding the Incomplete "I" grade. The I grade is not intended for ordinary cases of non-attendance or unexcused absences from class exams or other activities. The complete University policy for the Incomplete "I" grade is available on-line at: <https://catalog.buffalo.edu/policies/explanation.html>

ACADEMIC POLICIES AND PROCEDURES: The on-line version of the Undergraduate Catalog contains a full, detailed presentation of University policies relating to academic policies and procedures. All students should be familiar generally with the University's policies relating to course expectations and to grading, and to other matters. These are available at: <https://catalog.buffalo.edu/policies/>

Academic honesty is important, and each student is expected to do and to submit her/his own work according to instructions. Some in-class activities and out-of-class homework assignments may include allowances for among-student consultation or collaboration, but, in the end, each student should nevertheless submit her/his own paper. The University has an academic integrity policy that applies to this course. The policy is published in the Undergraduate Catalog and elsewhere, and students are asked to review this policy if they are not already familiar with it. The URL for the official University policy is: https://catalog.buffalo.edu/policies/academic_integrity_2019-20.html

ACCESSIBILITY RESOURCES: If you have a disability and require some type of instructional and/or examination accommodation, please inform the instructor early in the semester so that accommodations can be arranged. If you have not already done so, please contact the university's Office of Accessibility Resources. The office is located at 25 Capen Hall and the telephone number is 645-2608. Classroom instructional and exam accommodations will be made for students individually on the advice and guidance of the Office of Accessibility Resources. The Office of Accessibility Resources will host proctored exams for students with accommodations. It is the responsibility of the student to make the appropriate reservations in that case. For a full description of available services, refer to the Office of Accessibility Resources Web site at: <https://www.buffalo.edu/studentlife/who-we-are/departments/accessibility.html>

RELIGIOUS ACCOMMODATION: Any student desiring a reasonable religious accommodation should make the request directly to the course instructor. It is expected that the student will provide sufficient notice of the need for an accommodation to the course instructor in order for the accommodation to be implemented. In the event that a student's request for religious accommodation involves an exam, the student will be excused from the exam (with proration of a score) in order to meet her/his religious needs. If there are concerns about the requested

accommodation, the instructor should consult his/her department chair, dean's office and/or the university's Office of Equity, Diversity and Inclusion (EDI). The instructor will not unilaterally deny a request for a reasonable religious accommodation without first consulting EDI. The EDI Web site is: <https://www.buffalo.edu/equity.html>

COURSE MANAGEMENT SYSTEM: All registered students have access via UBLearn (http://ublearns.buffalo.edu) to the BIO 303 Physiology course content area. Please monitor regularly for posted announcements and class assignments from the instructor, and for other useful course documents and links.

COURSE SCHEDULE: The following is a tentative schedule; any changes will be announced in class.

SECTION	TOPICS AND ASSESSMENTS	READING (in Sadava, <i>Life: The Science of Biology</i> , 11 th edition)
1	1.1 Introduction and Course Overview	Chapter 39
	1.2 Cellular Physiology	Various chapters in Parts 1-3
	1.3 Neurophysiology	Chapter 44
	1.4 Sensory Systems	Chapters 45, 46
	Quiz 1: Thursday February 6th	
	Exam 1: Thursday February 20th	
2	2.1: Muscle	Chapter 47
	2.2: Circulatory Systems	Chapter 49
	2.3: Ventilation and Gas Exchange	Chapter 48
	Quiz 2: Thursday March 5th	
	Exam 2: Tuesday March 24th	
3	3.1: Salt and Water Balance	Chapter 51
	3.2: Digestion and Metabolism	Chapter 50
	3.3: Biomechanisms and Locomotion	Chapter 47
	Quiz 3: Tuesday April 7th	
	Exam 3: Thursday April 16th	
4	4.1: Thermoregulation	Chapter 39
	4.2: Chemical Communication	Chapter 40
	4.3: Immune Defense	Chapter 41
	4.4: Reproduction	Chapter 42, 52
	4.5: Integrative & Environmental Physiology	N/A
	Quiz 4: Thursday April 30th	
	Final 4: Section 4 AND sections 1-3, Thursday May 14th	

RELATIONSHIP OF BIO 303 COURSE OBJECTIVES AND ASSESSMENT TO BIO PROGRAM OBJECTIVES

BIO Program Objective	Depth*	Specific Outcome Objectives for BIO 303:	Assessment Instrument(s)
1. Provide breadth of knowledge of basic principles and concepts	2	Understand the physico-chemical basis of common physiological processes	Quizzes 1-4; Exams 1-3 and final exam
		Understand integrated cell, tissue and organ function in complex multicellular organisms	Quiz 1; exam 1 and final exam
2. Provide depth within specialized areas	2	Apply basic physiological principles to understanding individual systems (nerve transmission, sensory reception, muscle contraction, circulation, ventilation and respiration, digestion, osmoregulation and excretion, thermoregulation, chemical signaling and defense, and reproduction)	Quizzes 2-4; exams 2 and 3, and final exam
3. Provide an understanding of experimental design and methodology	0	N/A	N/A
4. Develop approaches for integration of information	2	Integrate physiological knowledge across scales of size (subcellular/cellular/tissue/organ) to explain organismal performance	Quizzes 1-4; Exams 1, 2 and 3, and final exam
		Combine biological and physico-chemical principles to explain organism-environment interactions	Final exam
5. Encourage critical thinking and hypothesis building	1	Analyze and interpret real and simulated data from physiological experiments	Freeform response sections of Exams 2 and 3, and final exam
		Relate natural history of organisms to environmental and physiological constraints on survival	Quizzes 2-4; exams 2 and 3, and final exam
6. Provide skills in scientific communication	1	Express topic understanding in clear prose. Relate methods, processes and conclusions of data analysis and interpretation in clear narrative and in technically-correct quantitative graphical/diagrammatic form	Freeform response sections of exams 1, 2 and 3, and final exam

7. Provide contemporary information	1	Understand contemporary human and natural influences on organisms in the context of physiological acclimation and adaptation, and survival	Final exam; review questions
8. Encourage appreciation of scientific values	1	Recognize proper and correct interpretation of physiological data collected from the field and from the laboratory	Exams 2 and 3, and final exam
		Identify the importance of physiological knowledge to understanding biosystems generally, and the implications of that knowledge in informing scientific and public policy	Quizzes 1-4; exams 1, 2 and 3, and final exam

*Depth: 0 = not covered; 1 = moderately covered; 2 = extensively