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BIOB 160N.30: Principles of Living Systems

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Course: **Principles of Living Systems BIOB 160**
4 credits

Instructor: James Van Leuven
James1.vanleuven@umontana.edu

Lecture: MTWR 11:30-1:20, HS207

Office hours M 1:20-3:30, HS304
W 3:30-4:30, HS304
By appointment

Teaching Assistant: Jamie Brusa
jlbwcc@gmail.com

Lab: TWR 1:30-3:20am, HS102, HS404, HS114

Textbook: *Campbell Biology 6th, 7th or 8th ed.*
Neil Campbell and Jane Reece

Other Resources Education Portal: Biology 101
<http://education-portal.com/academy/course/introduction-to-biology.html>

Course website
<https://sites.google.com/site/jtvanleuven/bio-160>

Note: All the information you need for the tests will be in the lectures. However, people have different learning styles and usually need to hear information at least twice before it sinks in. Therefore, I highly recommend following along in Campbell's Biology and/or the Education Portal site. Newer versions of Campbell's biology are expensive and contain a little more up-to-date information, but the older versions are almost the same and are way cheaper. I'll try to post the correct reading for each version, but they may be off. Do your best to find the information given in lecture in the book. The Education Portal course is put together by educators and scientists. I think it is very good for an introduction to biology. Pay attention to the course website, as I'll be posting course updates and documents (power points, labs, reading assignments, etc.) there.

Grading	Exam 1	50	
	Exam 2	50	
	Exam 3	50	
	Final	50	
	Daily Quizzes	35	(2-3 points each, 15 quizzes, 3 drops)
	Article Reports	15	(5 points each, may do 2 more for extra credit)
	<u>Lab Reports</u>	<u>100</u>	(10 points each, 1 drop)
	Total	350	points

If there is a discrepancy on a test or homework score please let me know. Simple grading errors can be fixed quickly during office hours. If you would like to argue

the validity of an answer, please provide the test or homework as well as a written description of the problem. I then have the right to re-grade the entire test or homework.

Late work No late work or missed exams will be accepted. Every class/lab is a large part of this summer course. Please let me know in advance if you have an event that forces you to miss a lab or test. Acceptable absences may include; participation in sports, doctor note, serious family illness or death, etc. I know that stuff happens sometimes, but there is flexibility written into the course point assignments in the form of drops and extra-credit.

Disabilities Accommodation for student disabilities will gladly be made for students registered with Disability Services for Students (DSS). Please contact me and the University DSS at 243-2243 or at <http://www.umd.edu/dss/>

Misconduct Please refer to http://life.umd.edu/vpsa/student_conduct.php. Needless to say, academic honesty is expected and misconduct will always be dealt with appropriately. Don't copy and paste text. Cite stuff if you didn't write it or come up with the idea.

Course goals This course is designed as an introduction to science and biology. My goal is to give you a broad understanding of the world around you and how scientists go about studying that world. We will learn about the chemical and biological components that make up all living things (atoms, proteins, cells, etc.) and how those living things interact with each other (competition, mutualisms, etc.). Inherently included in studying organisms, is studying how they change over time (evolution). Evolution is a fundamental process to learn in biology. We will learn what features allow evolution (genetics) and what forces affect it (population size, reproduction rate, genome organization, etc.). This is an introductory class and I hope it sparks your interest in biology. By all means, if you want to explore something further or just talk about an idea, take advantage of office hours or get in touch with me.

Lab goals The lab portion of this class should introduce you to the basics of the biology laboratory. You will learn how to do sterile technique, polymerase chain reaction (PCR), cell culture, and more. I also want you to learn how to design experiments and present work. Your lab grade will come from documentation of lab work, which is not necessarily the results obtained. We'll be looking for effort and thoughtfulness, not correctness. Each week (on Monday) you will submit your **Lab Report** to be graded. Each person in the group will submit their own work. I would prefer a typed document with the experiment conditions and outcomes.

In addition to reading the lab procedures, The University of Utah and HHMI have interactive virtual labs that can help show what is happening in lab experiments. I'll let you know when these virtual labs may be useful.

learn.genetics.utah.edu (no www.)
<http://www.hhmi.org/biointeractive/vlabs/>

Article Reports

For homework and to promote interest in current research, you will find and read an interesting article, podcast, or informational video on a topic related to the class material for that week. Write a paragraph or two about what you found interesting. Please use citations. Each will be worth 5 points and you can turn in up to 5 for a total of 25 points. Only one will be accepted per week (on Friday) per student (cannot wait until last day to turn in all of them). There are many sources of reading material that can be found free online:

www.sciencedaily.com

www.nature.com/nature/podcast/

www.sciencemag.org/site/multimedia/podcast/podcast/index.xhtml

<http://schaechter.asmblog.org/>

<http://blogs.plos.org/biologue/>

If you have trouble accessing papers from an off-campus computer you can log into the library website using your net id.

Go to:

www.lib.umt.edu/default.php

select the "Search Everything" tab and search for the journal that you are looking for.

The *Web of Science* is also a pretty good resource because it shows how many times a paper is cited, what papers cite it, etc. Click the "Database A-Z List", then click the "W" tab. The *Web of Science* is the fourth link down.

<http://libguides.lib.umt.edu/content.php?pid=93786&sid=700006>

Due Dates

Lab Reports are due each Monday. The report will include the completed reports from all three labs done the previous week. These will be collected during class on Monday. The last set of reports will be due by the end of lab on August 1.

Article Reports are due each Friday by midnight. I would prefer you email them to me in Microsoft Word or PDF format.

Class Schedule

	Topic	Readings
July 1	Why study science? How do we study science?	Campbell - Chap. 1 Web video 1, 2, 3
July 2	Chemistry of life	Campbell – Chap. 2 Web video 4, 5
July 3	Macromolecules	Campbell – Chap. 5 Web video 6, 7, 8, 9, 10, 11
July 4	Holiday! Please avoid dangerous fireworks.	No readings
July 8	Cycle of life: energy, waste, and metabolism	Campbell 6th – Chap. 9, 10

		Campbell 7/8th – Chap. 8, 9, 10 Web video 12, 13, 14
July 9	Multicellular organisms: structure/function	Campbell 6th – Chap. 7, 27 Campbell 7/8th – Chap. 6, 28 Web video 15, 16
July 10	Single cell organisms: cellular organization	Campbell 6th – Chap. 7, 27 Campbell 7/8th – Chap. 6, 27 Web video 17, 28
July 11	Extremophiles and Exam 1	No new readings
July 15	Populations: cell culture	Campbell 6th – Chap. 50, 52 Campbell 7/8th – Chap. 52, 53 Web video 18
July 16	Multi-species Ecology: Isle Royale	Campbell 6th – Chap. 50, 53 Campbell 7/8th – Chap. 52, 54 Web video 19, 20
July 17	Human Impact on Ecology	Campbell 6th – Chap. 55 Campbell 7/8th – Chap. 56 Web video 21, 22
July 18	Population genetics and Exam 2	No new readings
July 22	Basic genetics: genes, genomes, and alleles	Campbell – Chap. 16, 17 Web video 23, 24
July 23	Inheritance : Mendel's peas/pedigrees	Campbell – Chap. 14 Web video 25
July 24	Vertical vs. horizontal inheritance	Campbell 6th – Chap. 18 Campbell 7/8th – Chap. 19, 27
July 25	Intro to evolution and Exam 3	No new readings
July 29	Decent with modification: Darwin's finches and human evolution	Campbell – Chap. 22 Web video 26, 27
July 30	Experimental evolution: brewer's yeast	Campbell – Chap. 23
July 31	Molecular evolution: DNA and the tree of life	Campbell – Chap. 25, 26
Aug 1	Final	I think you've had enough already!

Lab Schedule

	Topic	Pre-lab readings
July 2	Measurements lab - HS102	Lab handout
July 3	Soap lab - HS102	Lab handout
July 4	Holiday!	None
July 9	Membranes and osmosis - HS102	Lab handout
July 10	Alcoholic Fermentation in Yeast and test review - HS102	Lab handout Lab video 1

July 11	DNA extraction and PCR - HS404	Lab handout Virtual lab 1-2
July 16	Molecular biology lab - HS404	Lab handout Virtual lab 3
July 17	Catch-up and test review - HS102	None
July 18	Cricket lab - HS102	Lab handout
July 23	Mitosis lab - HS102	Lab handout
July 24	Bacterial transformation and test review - HS404	Lab handout Lab video 2
July 25	Tasmanian Wolf lab - HS102	Lab handout
July 30	Phylogenetics lab - HS114	Lab handout
July 31	Catch up and test review - HS102	None
Aug 1	Help with lab write-ups and lab clean-up - HS102	None

Web video 1 - <http://education-portal.com/academy/lesson/the-scientific-method-steps-terms-examples.html>

Web video 2 - <http://education-portal.com/academy/lesson/experimental-design-in-science-definition-method.html>

Web video 3 - <http://education-portal.com/academy/lesson/how-to-read-scientific-graphs-charts.html>

Web video 4 - <http://education-portal.com/academy/lesson/the-atom.html>

Web video 5 - <http://education-portal.com/academy/lesson/osmosis-diffusion-and-saturation.html>

Web video 6 - <http://education-portal.com/academy/lesson/structure-and-function-of-lipids.html>

Web video 7 - <http://education-portal.com/academy/lesson/proteins-i-chemical-structure.html>

Web video 8 - <http://education-portal.com/academy/lesson/proteins-iii-polymerization.html>

Web video 9 - <http://education-portal.com/academy/lesson/dna-and-the-chemical-structure-of-nucleic-acids.html>

Web video 10 - <http://education-portal.com/academy/lesson/dna-adenine-guanine-cytosine-thymine-complementary-base-pairing.html>

Web video 11 - <http://education-portal.com/academy/lesson/dna-double-helix-structure-and-hereditary-molecule.html>

Web video 12 - <http://education-portal.com/academy/lesson/cellular-respiration-energy-transfer-in-cells.html>

Web video 13 - <http://education-portal.com/academy/lesson/anaerobic-respiration-glycolysis.html>

Web video 14 - <http://education-portal.com/academy/lesson/photosynthesis-i-photolysis-and-the-light-reactions.html>

Web video 15 - <http://education-portal.com/academy/lesson/structure-of-the-nucleus-nucleolus-nuclear-membrane-and-nuclear-pores.html>

Web video 16 - <http://education-portal.com/academy/lesson/the-fluid-mosaic-model-of-the-cell-membrane.html>

Web video 17 - <http://education-portal.com/academy/lesson/eukaryotic-and-prokaryotic-cells-similarities-and-differences.html>

Web video 18 - <http://education-portal.com/academy/lesson/populations-density-survivorship-and-life-histories.html>

Web video 19 - <http://education-portal.com/academy/lesson/ecosystems-habitats-and-ecological-niches.html>

Web video 20 - <http://education-portal.com/academy/lesson/interspecific-competition-competitive-exclusion-niche-differentiation.html>

Web video 21 - <http://education-portal.com/academy/lesson/how-introduced-and-invasive-species-alter-ecological-balance.html>

Web video 22 - <http://education-portal.com/academy/lesson/fossil-fuels-greenhouse-gases-and-global-warming.html>

Web video 23 - <http://education-portal.com/academy/lesson/transcription-of-messenger-rna-mrna-from-dna.html>

Web video 24 - <http://education-portal.com/academy/lesson/effects-of-mutations-on-protein-function-frameshift-silent-nonsense-missense-mutations.html>

Web video 25 - <http://education-portal.com/academy/lesson/dominant-versus-recessive.html>

Web video 26 - <http://education-portal.com/academy/lesson/theory-of-evolution.html>

Web video 27 - <http://education-portal.com/academy/lesson/natural-selection-and-adaptation.html>

Web video 28 - <http://education-portal.com/academy/lesson/the-evolution-of-prokaryotes-archaebacteria-and-eubacteria.html>

Lab video 1 - <http://videos.howstuffworks.com/discovery/34874-howstuffworks-show-episode-5-fermentation-video.htm>

Virtual lab 1 - <http://learn.genetics.utah.edu/content/labs/extraction/>

Virtual lab 2 - <http://learn.genetics.utah.edu/content/labs/pcr/>

Virtual lab 3 - <http://learn.genetics.utah.edu/content/labs/gel/>

Lab video 2 - <http://www.youtube.com/watch?v=AEINuCL-5wc>