

Annexe A: New/Revised Course Content in OBTL+ Format

Course Overview

Expected Implementation in Academic Year (New format)	AY2018-2019
Semester/Trimester/Others (specify approx. Start/End date)	Semester 2
Course Author * Faculty proposing/revising the course	Dr Shawn Lum
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Course Title	PLANT & ANIMAL PHYSIOLOGY
Course Code	ES3301
Academic Units	4
Contact Hours	52
Research Experience Components	

Course Requisites (if applicable)

Pre-requisites	BS1001 Introductory Biology, ES2003 E2S2 Biosphere, ES2301 Principles of Heredity and Ecological Genetics
Co-requisites	
Pre-requisite to	
Mutually exclusive to	
Replacement course to	
Remarks (if any)	

Course Aims

You will synthesise information in two ways: (1) you will be expected to link physiological processes across various levels of organisation from genes to populations and ecosystems, and (2) to take a comparative approach to the study of physiology. Moreover, you will be expected to see physiological processes through the lens of natural selection in order to understand how physiological mechanisms evolve and diversify in response to the physical and biotic environments in which organisms live.

Course's Intended Learning Outcomes (ILOs)

Upon the successful completion of this course, you (student) would be able to:

ILO 1	Compare the basic functioning of organ systems that sustain the life of plants and animals at different levels of evolutionary complexity.
ILO 2	Draw conclusions on organisms' niche adaptation from looking at physiological organs in both animals and plants in practical exercises and drawings.
ILO 3	Link molecular processes of organisms to the levels of community, population and ecosystem.
ILO 4	Use physiological concepts to explain current and future effects of changing environmental conditions on organisms.
ILO 5	Express intellectual flexibility by finding new approaches to issues in physiology/ecophysiology.
ILO 6	Formulate relevant scientific research questions in specific topics on physiology/ecophysiology.
ILO 7	Synthesise, communicate and evaluate scientific information, both orally and in writing.
ILO 8	Critically assess and give constructive suggestions for improvements of the work of peers.
ILO 9	Identify and address ethical issues related to the study and research of physiology.

Course Content

Week 1: Course introduction. What is physiology? Basic principles for life. Overview of organ systems in animals. Basic concepts: homeostasis, metabolic rate etc. Week 2: Visit to Natural History Museum at NUS. Evolution, biological diversity, phylogeny and basic morphology. Week 3: The digestive system and excretory system Week 4: External respiration, circulation, gas exchange Week 5: Communication: Nervous system and Endocrine physiology Week 6: Reproduction in animals and repetition. Week 7: Quiz and student presentations Week 8: Intro to plant physiology. Basic plant organs and tissues. Plant phylogeny. Week 9: Plant life cycles and reproduction. Week 10: Photosynthesis, photorespiration, C4 and CAM Week 11: Communication in plants Week 12: Mineral nutrition and mycorrhiza Week 13: Quiz and hand in Plant Essay

Reading and References (if applicable)

Literature: Reece, Jane B. et al. Campbell Biology: Concepts & Connections, 8th or 9th edition. Lecture material and other assigned reading. Additional reading: Hill, Wyse and Anderson Animal Physiology (latest edition) Salsbury and Ross Plant Physiology 4th ed.

Planned Schedule

Week or Session	Topics or Themes	ILO	Delivery Mode	Activities	Readings
1	Course introduction. What is physiology? Basic principles for life. Overview of organ systems in animals. Basic concepts: homeostasis, metabolic rate etc.	1, 2, 3, 4, 5, 9	In-person		*Directions for reading will be given at the start of and throughout the course. Reading assignments will involve the course literature as well as other material (like scientific articles), and can vary between years.
2	Visit to Natural History Museum at NUS. Evolution, diversity, phylogeny and basic morphology.	1, 2, 3, 4, 5, 6, 7, 9	In-person	Pick a topic for group project. Start to make outline and research.	
3	The digestive system and excretory system	1, 2, 3, 4, 5, 6, 7, 9	In-person	Continue to work on project. Hand in outline by Friday.	
4	External respiration, circulation, gas exchange	1, 2, 3, 4, 5, 6, 7, 9	In-person	Continue to work on project.	
5	Communication: Nervous system and Endocrine physiology	1, 2, 3, 4, 5, 6, 7, 9	In-person	Continue to work on project.	
6	Reproduction in animals and reptition	1, 2, 3, 4, 5, 6, 7, 9	In-person	Continue to work on project.	
7	Quiz and student presentations	1, 2, 3, 4, 5, 6, 7, 8, 9	In-person	Present project work in class.	
8	Intro to plant physiology. Plant phylogeny. Basic plant organs and tissues.	1, 2, 3, 4, 5, 6, 7, 9	In-person	Pick a topic for plant essay.	

Week or Session	Topics or Themes	ILO	Delivery Mode	Activities	Readings
9	Life cycles and reproduction in plants.	1, 2, 3, 4, 5, 6, 7, 9	In-person	Plant essay first outline Friday.	
10	Photosynthesis, photorespiration, C4 and CAM	1, 2, 3, 4, 5, 6, 7, 9	In-person	Continue to work on plant essay.	
11	Communication in plants	1, 2, 3, 4, 5, 6, 7, 9	In-person	Continue to work on plant essay.	
12	Mineral nutrition and mycorrhiza	1, 2, 4, 5, 6, 7, 8, 9	In-person	Continue to work on plant essay. Give feedback on peer's essay drafts.	
13	Quiz and hand in Plant Essay	1, 2, 3, 4, 5, 6, 7, 9	In-person	Finalize plant essay.	

Learning and Teaching Approach

Approach	How does this approach support you in achieving the learning outcomes?
General	I try to offer a variety of learning approaches, to cater for different learning profiles.
Group discussion	After some lecturing, you will be presented with a real world problem that you have to apply the theory in the lecture to solve. In group discussions, I often mix you up to sit with someone that you don't usually sit with, because I think that makes you focus better and hopefully learn more.
Practical exercises	In physiology, we talk a lot about different parts of plant and animal physiology. To actually dissect a fish, or a leaf or stem and look at real structures reinforces the theory and is fun. In plant physiology I often bring fresh plants as examples.
Projects with an element of free choice	For the essay and presentation, you get to pick a topic within physiology that interests you (I provide a list of suggestions, but they may also come up with their own). I find that working with a topic of your own choice enhances your motivation and therefore learning.

Assessment Structure

Assessment Components (includes both continuous and summative assessment)

No.	Component	ILO	Related PLO or Accreditation	Weightage	Description of Assessment Component	Team/Individual	Rubrics	Level of Understanding
1	Continuous Assessment (CA): Others([quiz/test] Animal Phys. Quiz)	1, 2, 3, 4, 5, 6, 7	1, 2, 3, 4, 6, 7, 8	20		Individual		
2	Continuous Assessment (CA): Others([presentations] Oral Presentation)	1, 2, 3, 4, 5, 6, 7,9	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	25		Team		
3	Continuous Assessment (CA): Others([quiz/test] Plant Phys. Quiz)	1, 2, 3, 4, 5, 6, 7	1, 2, 3, 4, 6, 7, 8	20		Individual		
4	Continuous Assessment (CA): Others([assignments (e.g. term paper, essay)] Plant Phys. Essay)	1, 2, 3, 4, 5, 6, 7,9	1, 2, 3, 4, 5, 6, 7, 8, 9	25		Individual		
5	Continuous Assessment (CA): Others([group or individual projects/evaluations] Peer feedback)	1, 2, 3, 4, 5, 8,9	1, 2, 3, 4, 6, 7, 8, 10	10				

Description of Assessment Components (if applicable)

Formative Feedback

1. After each lecture I provide a quick Kahoot! quiz on the most important theory in the lecture that you take anonymously. This way I know if there is something that most or any of you do not understand. It also informs you on how you are doing in terms of what I expect you to know.

2. In class I regularly break the lecture off with group discussion or practical exercises. This gives me a chance to interact with you all, check your understanding and give general feedback. For these exercises I use questions similar to what I use in the quizzes.

3. For the two major assignments, the oral presentation and the essay, I have you hand in topic and outline to me for feedback. I give you the opportunity to e-mail me for feedback throughout your working process (some use this, most not), and you also have to show me what you have accomplished so far the week before hand-in, so that I can give you some hints on what you should work on before the final hand-in.

NTU Graduate Attributes/Competency Mapping

This course intends to develop the following graduate attributes and competencies (maximum 5 most relevant)

Attributes/Competency	Level
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Course Policy

Policy (Academic Integrity)

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Policy (General)

(1) General

You are expected to complete all assigned pre-class readings and activities, attend all seminar classes punctually and take all scheduled assignments and tests by due dates. You are expected to take responsibility to follow up with course notes, assignments and course related announcements for seminar sessions you have missed. You are expected to participate in all seminar discussions and activities.

Policy (Absenteeism)

(2) Absenteeism

This course requires you to be present in class and contribute to class activities. The quiz part of the assessment will build on material from the lectures. Absence from class without a valid reason will affect your overall course grade. Valid reasons include falling sick supported by a medical certificate and participation in NTU's approved activities supported by an excuse letter from the relevant bodies.

If you miss a lecture or tutorial, you must inform the teacher via email prior to the start of the class.

Policy (Others, if applicable)

(3) Compulsory Assignments

You are required to submit/present compulsory assignments on due dates.

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Last Updated By: Sze Chun Chau (Dr)