DEPARTMENT OF BIOLOGY COLLEGE OF ARTS AND SCIENCES University of the Philippines Manila

BIOLOGY 160 FUNDAMENTALS OF ECOLOGY

COURSE DESCRIPTION: An examination of the interactions between biotic and abiotic factors, and between species in biotic communities covering theory, laboratory, and field studies. Ecological analyses at the level of the population, community, and ecosystem.

COURSE CREDIT: COURSE PREREQUISITES: COURSE GOALS:	5 units (3 units lec, 2 units lab) 9 hours/week (3 hours lecture, 6 hours laboratory) Bio 180, Bio 116 or Bio 128 To enable the students to understand the principal concepts and theories that guide ecological inquiry, the methods that are used to answer ecological questions, and the applications of ecological principles in the understanding of current and emerging environmental problems in our generation. Particular emphasis will be given to population, community, and ecosystem. The practical component of the course will include laboratory exercises, as well as field studies.
COURSE OUTCOMES:	 By the end of the course, the students should be able to: 1. Explain the various ecological concepts and principles at the level of individual, population, community, and ecosystems. 2. Apply the knowledge and principles gained from the course in having informed decisions and in devising mitigation strategies for solving natural, biological, and environmental issue and concerns. 3. Demonstrate the use of appropriate sampling techniques to study animal and plant ecology in the field. 4. Design and carry out a research proposal (formulate good research questions, implement field sampling methods, analyze data using appropriate statistical techniques. 5. Communicate research findings and personal development orally and in writing.

COURSE OUTLINE:

UNITI	LEARNING OBJECTIVES
INTRODUCTION, EVOLUTION & ADAPTATION,	On completion of this unit, the students should be
ORGANISM AND THE ABIOTIC ENVIRONMENT	able to:
 Introduction: Significance, Definitions, History, Methods of ecological study, effects of scale, statistics in ecology 	 explain the definition of ecology, including the diversity of information needed to understand ecology
 Organisms and the abiotic environment: Adaptation and range of tolerance; nutrients, and soil conditions 	 describe the history of ecology as a scientific discipline examine how an ecologist does research
3. Organisms and the abiotic environment: Temperature and moisture	 discuss the levels of biological organization covered in ecology
4. Organisms and the abiotic environment: Climate, light, and periodicities	 argue that adaptations exist that allow organisms to cope with conditions that fall outside the range of tolerance explain the roles of the different abiotic limits in influencing the survival, abundance,

EXAMINATION 1 and distribution of organism including nutrients, soil factors, temperature, moisture, climate, light, and periodicities. ECOSYSTEM ECOLOGY: SYSTEM CONCEPT, DEFINITIONS, ENERGY FLOW, MATERIAL CYCLING, TERRESTIRLA, QUATIC ECOSYSTEMS LEARNING OBJECTIVES S. Ecosystem Concept and Definitions - tell why an ecosystem is a system 5. Ecosystem Concept and Definitions - tell why an ecosystem is a system 6. Energy Flow in the Ecosystem: laws of chains, food webs, trophic levels, ecological efficiencies, and energy budgets - tell why an ecosystem is a system 7. Nutrient (I Biogeochemical Cycles) and Pollution: water cycle; nutrient, heavy metal, and hydrocarbon cycling; ozone depletion, global climate change, acid magnification - examine how human activities have violated the principles governing the flow of energy and cycling of nutrients that have led to pollution and environmental degradation some of the environmental degradation, loss of bioliversity, corations; wetlands, stuaries; Marine ecosystem; conations; wetlands, exuaries; Marine ecosystem; conations; segrass, mangrove, coral reef, sandy and rocky shore ecosystem; structure and functions - explore the various types and ecological significance of the terrestrial and aquatic ecosystems: conation; wetlands, exuaries; Marine ecosystems; conation; segrass, mangrove, coral reef, sandy and rocky shore ecosystems; structure and functions - explore the various types and ecological significance of the terrestrial and aquatic ecosystems competity, mortality, survitorship curve, life tables, age structure, sex ratio, dependent				
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commensalism, competition, predation, parasitism, - discuss the various forms of population protocooperation, mutualism; Intra and interspecific interactions in nature				
competition; Verhulst Pearl and Lotka-Volterra - develop competence in analyzing the				
equations various models on population and growth	•			
		and competition (eg. Lotka-Volterra models)		
fundamental and realized niches - explain how potentially competing species	1 ± 7 . Competition methes and the Niche Concept,			
may coexist		 explain how potentially competing species 		

EXAMINATION 3 UNIT IV POPULATION ECOLOGY (cont'd), PREDATION THEORY AND MODELS, COEVOLUTION, POPULATION GENETICS, COMMUNITY ECOLOGY, SUCCESSION AND ISLAND BIOGEOGRAPHY 15. Population Ecology: Predation, Parasitism, and Predator-preys systems; Lotka Volterra models, Rosenszweig-McArthur models, and Nicholson- Bailey model, Holling's disc equation 16. Coevolution: Predator-prey system, predator tactics, prey defenses; mutualism systems, and social parasitism - sketch the Lotka-Volterra as well as Rosenzweig-McArthur models of predator- tractics, prey defenses; mutualism system, and social parasitism 17. Population Genetics: The Hardy-Weinberg Law, Natural Selection, and Speciation - explain functional and numerical responses (Holling's disc equation) 18. Community Ecology: Structure, Abundance, and Diversity Measurements; vertical and horizontal 18. community Ecology: Stability and Ecological succession; autogenic and allogenic succession; primary and secondary succession; pioneer and climax communities - explain the differences between adaptation, natural selection, and species vary across their geographic range 20. Community Ecology: Island Biogeography; conservation biology - sumarize how species dominance influences the terrestrial community 21. Special Topics in Ecology (optional) eg. ecological restoration; landscape ecology; conservation ecology: invaive species; integrated pest management - define the concept of species diversity - define the concept of a climax community - differentiate the three models of species abundance - define the concept of a cl		
EXAMINATION 3 UNIT IV POPULATION ECOLOGY (cont'd), PREDATION THEORY AND MODELS, COEVOLUTION, POPULATION ECOLOGY (cont'd), PREDATION THEORY AND MODELS, COEVOLUTION, POPULATION ECOLOGY (cont'd), PREDATION The Correst of this unit, the students should be able to: 15. Population Ecology: Predation, Parasitism, and Predator-prey systems; Lotta Volterra models, and Nicholson-Bailey model, Holling's disc equation 16. Coevolution: Predator-prey system, predator tactics, prev defenses; mutualism systems, and social parasitism 17. Population Genetics: The Hardy-Weinberg Law, Natural Selection, and Speciation 18. Community Ecology: Structure, Abundance, and Diversity Measurements; vertical and horizontal and mutualism 19. Community Ecology: Structure, Abundance, and Diversity Measurements; vertical and horizontal structure; geometric, log normal, and broken stick models; Shannon-Weiner, Simpsons indices; community scology: Stability and Ecological Succession; autogenic and allogenic succession; primary and secondary succession; pioneer and climax communities explain the differences between adaptation, natural selection, and Species dominance influences community structure; explain how species dominance influences community Ecology: Stability and Ecological Succession; autogenic and allogenic succession; primary and secondary succession; pioneer and ecology; invasive species; integrated pest management explain how species dominance influences community structure; explain how species dominance inf		- relate the concept of niche to interspecific
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GENERAL ACTIVITIES:

- Lectures, Quizzes, Problem exercises, Assignments
- Group discussion, case study, written reports
- Laboratory Exercises (see below)

COURSE REQUIREMENTS

Lecture

- Examinations ----- 70.0%
- Individual/paired Quizzes ------ 15.0%
- Assignment (indiv/Group)----- 7.5%
- Topic Report/Journal Report/Case study- 7.5%

100.0%

GRADING SYSTEM

- 1. The prefinal grade computation is based on 60% lecture grade and 40% laboratory grade. If the student is exempted from taking the final examination, the prefinal grade becomes the final grade.
- 2. To be exempted from taking the final exam, the student must have an average of 70% (2.5) or better in the lecture and laboratory.
- 3. For students who are not exempted from the final exam, the prefinal grade will be 80% while the final examination is 20%.
- 4. If a student missed an exam due to justifiable reason, he/she is required to take the final exam. His/her score in that exam will substitute for the missed exam. Only one missed exam is allowed.

GRADING SYSTEM:					
93-100	=	1.00	70-74	=	2.50
90-92	=	1.25	65-69	=	2.75
87-89	=	1.50	60-64	=	3.00
84-86	=	1.75	54-59	=	4.00
80-83	=	2.00	Below 54	=	5.00
75-70	=	2.25			

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UNIVERSITY OF THE PHILIPPINES MANILA DEPARTMENT OF BIOLOGY

BIOLOGY 160 LABORATORY Schedule of Laboratory Activities

No. of Meetngs	Activity	
-	Orientation	
	Exercise 1 – Climatic factors	
	Exercise 2 – Edaphic factors	
	Exercise 6A – Terrestrial productivity setup	
	Exercise 4 – Effect of pH, temperature, salinity on organisms	
	Exercise 3 – Water analysis	
	Exercise 6B – Aquatic productivity	
	Exercise 5 – Food chain	
	Exercise 7 – Herbivory	
	Exercise 6A - Processing	
	Reporting Ex 1 to 7	
	1 st Long Exam	
	Exercise 8 – Population estimation	
	Exercise 9 – Population growth	
	Exercise 10 – Population mortality	
	Exercise 11 – Population distribution	
	Reporting Ex 8 to 11	
	Bioweek (no meeting)	
	2 nd Long Exam	
	Exercise 12 – Plant competition	
	Pre-lab for field work	
	Exercise 14 – Predator-Prey interactions	
	Exercise 15 – Functional response of predators	
	Preparation for field work and special problem	
	Field work for Exercises 13, 16 and 17 Processing of data: Creation of reports	
	Processing of data; Creation of reports Reporting of Ex 12 to 17 and Special Problem	
	3 rd Long Exam	

Grading system: 40% OF BIO 160 GRADE

60%
10%
15%
10%
<u> </u>
100%

FACULTY-IN-CHARGE:

Arnold V. Hallare, Dr. *rer nat* (Lecture)

Neil Edsel Ramirez, MSc (Laboratory)