DEPARTMENT OF BIOLOGY
College of Arts and Sciences
University of the Philippines Manila

# Biology 166 Ecosystem Health

## A. Course Catalogue Description

1. Course Code: Biology 166
2. Course Title: Ecosystem Health
3. Course Description: Systematic examination of an emergent paradigm in environmental management, ecosystem health, and resilience thinking with focus on the evaluation of environmental issues using key indicators of system health such as integrity, resilience, vigour, diversity, stability, and adaptability.
   In the approved BS Bio Curriculum: Concerns on the relationships between biophysical changes, disease burdens on the living systems and the social structure and economic sustainability of communities.
4. Prerequisite: Biology 160
5. Semester Offered: 2nd semesters
6. Course Credit: 5.0 (Lecture: 3 units; Laboratory: 2 units)
7. Number of Hours: Lecture: 3 hours per week Laboratory: 6 hours per week)
8. Meeting Type: Lecture: Discussion/Blended-learning
9. Course Goals: To enable students to critically evaluate key components of ecosystem health and resilience theory to be able to interpret, understand, and analyze real world case studies in complex adapative systems.

## B. Rationale

The biosphere is comprised of various kinds of ecosystems. These ecosystems provide basic services to humans. Therefore, understanding the key components of ecosystem health is very crucial for the development of strategies for the sustainable management of the Earth's ecosystems for the present as well as for future generations.

## C. Course Outline

### 1. Course Outcomes (CO)

By the end of the course, the student should be able to:

**CO 1.** Explain the relationship between resilience, transdisciplinarity, ecosystem health, and ultimately sustainability.

**CO 2.** Critically evaluate key components of ecosystem health and resilience theory.

**CO 3.** Use ecosystem health and resilience theory to interpret, understand, and analyze real world case studies in complex adaptive systems.

**B.S. Biology Program Objectives:**

1. To develop substantial understanding of life and living processes
2. To demonstrate proficiency in oral and written communication skills
3. To engage in cutting-edge research with minimal supervision
4. To formulate methods and strategies to address health and environmental problems through a systems approach
5. To demonstrate competencies in areas of ecology, genetics, molecular biology, physiology, and developmental biology
6. To demonstrate social and professional responsibility and ethical behavior in multi-cultural settings and scenarios

**Mapping of BIO Course Outcomes vis-à-vis Program Outcomes:**

| BIO 166 Course Outcomes<br>After completing Bio 166 (Ecosystem Health) the student sh<br>able to: | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|---|---|---|---|---|---|---|
| 1. Explain the relationship between resilience, transdisciplinarity, ecosystem health, and ultimately sustainability. | P | D | P | P | D | P |
| 2. Critically evaluate key components of ecosystem health and resilience theory | I | D | P | P | P | D |
| 3. Use ecosystem health and resilience theory to interpret, understand, and analyze real world case studies in complex adaptive systems | P | D | P | D | D | D |
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**I**/K = Introduces **KNOWLEDGE** of the outcome
**P**/U = Strengthens **UNDERSTANDING** of the outcome
**D**/P = Demonstrates **PROFICIENCY** in the outcome

**3. Course Content**

| **Lecture Topics** |
|---|
| I. Exploring the linkages of Ecosystems and Human Health<br>A. Ecosystem health: origins of the concept, criticisms and goals of conservation<br>B. Ecosystem services and Human Health<br>C. Linkages between ecosystems and human health |
| II. Approaches of Ecosystem Health<br>A. Methodological Pillars of Ecosystem Health Approach: Transdisciplinarity, Community Participation and Gender Equity<br>B. Lessons and Successes of the Ecosystem Health Approach |
| III. Planning for a Sustainable Future<br>A. Assessing the health of Ecosystems<br>B. Community-Based Participatory Research for Ecosystem Health<br>C. Ecosystem Health Project: Terrestrial and Aquatic Environments<br>D. Planning for a Healthy Community: Case Study<br>E. Challenges and Ethical Dilemmas in Ecosystem Health Research |
| IV. Critical Approach to Ecosystem Health: Principles and Practices<br>A. Examining Environmental Problems from a Critical Perspective |

| Laboratory Topics |
| --- |
| I. Exploring the linkages of Ecosystems and Human Health<br>A. The role of ecosystem health assessment in environmental management: Concept and Indicators |
| II. Ecosystem Health Assessment<br>A. Indicators for the Assessment of Ecosystem Health<br>B. Theoretical Basis and Procedures of Ecosystem Health Assessments |
| III. Planning for a Sustainable Future<br>A. Systems View of Ecosystem Health<br>B. Application of Environmental Indicators to assess ecosystem health: Terrestrial Environments<br>C. Application of Environmental Indicators to assess ecosystem health: Aquatic Environments |
| IV. Critical Approach to Ecosystem Health: Principles and Practices<br>A. Measuring Changes in Ecosystem Health<br>B. Restoring Ecosystem Health |

**4. Course Coverage**

| Week | Learning Outcomes | TOPIC | Essential Questions | Suggested Teaching and Learning Activities | Assessment Tools | Learning Resources |
|---|---|---|---|---|---|---|
| 1-2 | To explore the link of ecosystems and health | Ecosystem Health: Concepts of Ecosystem, Human Health and Integration of Ecosystem Health, Criticisms and goals of conservation<br><br>Ecosystem Services and Human Health | Can society remain healthy in a sick world?<br>Are there inextricable links between the human population and their biophysical, social and economic environments?<br>Are these links of ecosystem health reflected in the population's state of health? | • Lecture discussion<br>• Integration by a concept map | • Exam<br>• Quizzes<br>• Assignments<br>• Synthesis/ Review paper<br>• Oral reports<br>• Field Work Report<br>• Laboratory Report | • Projector and laptop<br>• Useful websites<br>• Videos<br>• Journals<br>• Books<br>• Field Trips |
| 2-4 | To assess the approaches of ecosystem health<br>To examine the methodological pillas of ecosystem health approach<br>To critically appraise the lessons and success of ecosystem health approach | Methodological Pillars of Ecosystem Health Approach<br>Methodological Approaches and Processes of Ecosystem Health<br>Application of Ecosystem Health Approach: Lessons and Successes<br>Policy Frameworks on Ecosystem Health | What are the technological, social, political and economic sources of solutions to the problems?<br>What are the priority actions that should be taken to protect, preserve and or restore the health of ecosystems and the health of human populations? | Lecture and video clips<br><br>Games<br>Case Studies and Reports | | |

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|---|---|---|---|---|---|---|
| | | | | • Lectures<br>• Discussions<br>• Video presentation | | |
| 5-12 | To develop an ecosystem health plan<br>To critically assess the health of ecosystems<br>To analyze the systems view of ecosystem health<br>To assess the indicators of ecosystem health<br>To apply the indices of planning a healthy ecosystem of communities | Assessing the health of ecosystems<br>Systems View of Ecosystem Health<br>Community based approach of Ecosystem Health Assessments<br>Ecosystem Health Indicators<br>Ecosystem Health Assessment: Terrestrial and Aquatic Environments | How are the health of ecosystems assessed?<br>What is the systems view of ecosystem health?<br>Differentiate the approaches of ecosystem health assessments?<br>Discuss the ecological indicators for ecosystem health assessment? | • Lectures<br>• Discussions<br>• Video presentation<br>• Case Studies and Reports<br>• Field Trips and Field Work | EXAM 2<br>EXAM 3 | |
| 13-15 | To examine the status, issues and threats of ecosystem degradation, and destruction<br>To assess the ecosystem health of environments (terrestrial and or aquatic)<br>To measure changes of ecosystem health | Critical Approaches to Ecosystem Health<br>• Ecosystem Health Issues<br>• Ecosystem Health Changes<br>• Restoring Ecosystem Health<br>• Ecosystem Health and Sustainability | What is the role of ecosystem health in attaining sustainability?<br>How do we indicate the health and integrity of ecosystems?<br>How do we restore the degraded and or affected ecosystems from natural and man-made activities? | • Lab Exercises and Discussions<br>• Lab Reports | EXAM 4 | |

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| 16 | To develop measures of restoring ecosystem health<br>To develop ecosystem health approaches in planning for a sustainable future<br><br>Integration of Ecosystem Health in relation to the Millenium Ecosystem Assessment | Millenium Ecosystem Assessment | How have ecosystems changed on the global, regional and local perspectives?<br>What are the critical factors responsible for causing these ecosystem changes?<br>What can be learned from the consequences brought about by ecosystem changes?<br>What are the uncertainties and challenges hindering decision making concerning our ecosystems? | Lecture<br>Case Studies<br>Video Presentations | Synthesis/Integration Report<br>Ecosystem Health Assessment Report<br>Intervention Outputs (Plan, Poster, IEC Materials) | |

## 5. Course Requirements

| Lecture | |
|---|---|
| Long Examinations (4) | 70% |
| Quizzes | 15% |
| Assignments | 7.5% |
| Oral Reports/Synthesis Reports | 7.5% |
| TOTAL | 100% |

| Laboratory | |
|---|---|
| Long Examinations (3) | 30% |
| Research Project | 30% |
| Written and Oral Reports | 20% |
| Lab Performance | 20% |
| TOTAL | 100% |

Lecture

*Long Examinations*

There will be four lecture exams to assess student learning, one in the middle of the term, and the other at the end.

*Synthesis/Review Paper*

The student shall prepare a synthesis paper based on his/her chosen topic. This requirement aims to assess the ability of the student to digest information and ideas and infer relationships from various sources.

*Oral Reports*

Students will be evaluated on their ability to communicate scientific information and provide insights on assigned topics.

Laboratory

*Long Examination*

There will be two exams in the laboratory, and this aims to assess the student's ability to interpret and analyse ecological data.

*Research Project*

Students will work in small groups and design their own research project from a topic of their own choosing. The students will be evaluated on their ability to design and carry out sound ecological research, as well as in their ability to communicate their findings both in oral and written formats.

## Course Policies:

## Course Policies:

1. Long Examinations
    a. All exams are departmental. Exams are scheduled at the beginning of the semester and will only be rescheduled in cases of extreme weather and holiday declarations.

b. No make-up exams will be given. Students who miss any exam (lecture or laboratory) for a valid reason will automatically take the Final Exam at the end of the semester, provided that the student presents a valid excuse slip (medical certificate from UP Health Service only) not later than two weeks from the student's return from absence. The grade of the Final Exam will take the place of the missed exam. If the student's absence is not excused, the student receives a zero for the missed exam.

2. Final Examinations
   a. A comprehensive final examination will be given at the end of the semester and will cover lessons from both the lecture and laboratory parts. It will comprise 20% of the final grade for the course.
   b. A student who incurs a grade of **54% or below** in either lecture or laboratory component will automatically get a grade of **5.0** in the course.
   c. A student may be exempted from taking the final examination under the following conditions:
      - No missed examination
      - Pre-final grade is **2.5 (70%) or better**
   d. Computation of final grades will be as follows: 80% (pre-final grade) + 20% (final exam score)
      - If the combined pre-final grade and final exam score is 60 or better, then the student passes the course.
      - If the combined pre-final grade and final exam score is 54 or below, then the student fails the course.
      - If the combined pre-final grade and final exam score falls between 55-59, the student gets a grade of 4.0 and will be allowed to take a removal exams if she/he has no excessive absences in both lecture and laboratory.

3. Class Rules
   a. Mobile phones and other electronic gadgets must be turned off or put into silent mode during class hours. Making calls and sending text messages are strictly prohibited. However, important calls or text messages may be sent or accepted outside the classroom.
   b. Eating and drinking are not allowed during class hours.
   c. A monitor is assigned for each laboratory period. They are responsible for signing out all material and equipment for the laboratory exercise.
   d. All unkept and unlabeled samples and set-up will be discarded.
   e. All flora and faunal samples (both laboratory and field setting) must be handled with utmost respect and care. Faunal samples must be released back in the wild.
   f. All equipment and instruments must be cleaned and returned to the stockroom at the end of each laboratory/field class/exercise. Laboratory rooms must be cleaned as well after class.
   g. Students who fail to comply with any of these rules will receive demerits in their pre-final grade.
   h. CHEATING in any form, whether premeditated or not, automatically merits a grade of 5.00 for the course.

**University Grading Scale:**

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|---|---|
| 93 – 100 | 1.00 |
| 90 – 92 - | 1.25 |
| 87 – 89 - | 1.50 |
| 84 – 86 - | 1.75 |
| 80 – 83 - | 2.00 |
| 75 – 79 - | 2.25 |
| 70 – 74 - | 2.50 |
| 65 – 69 - | 2.75 |
| 60 – 64 - | 3.00 |
| 55 – 59 - | 4.00 |
| 54 and below - | 5.00 |

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## D. References


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## A. List of faculty members who will handle the course:

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Glenn Sia Su, PhD
Neil Ramirez, MSc
Kimberly Benjamin, MSc
Melody Ocampo, MSc
Samuel Go, MSc
Jeffrey Mancera, MSc
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