PROPOSAL FOR THE INSTITUTION OF SCIENCE 11
Living Systems: Concepts and Dynamics

I. Identifying and Descriptive Information

A. Course Catalogue Description

1. **Course number:** SCIENCE 11
2. **Course Title:** Living Systems: Concepts and Dynamics
3. **Course Description:** Principles, interactions, and contemporary issues concerning living systems
4. **Prerequisite:** None
5. **Semester Offered:** Can be offered at any semester
6. **Course Credit:** 3
7. **Number of Hours:** 3 hours/week
8. **Course Goal:** For the students to think critically, creatively and integratively on issues involving living systems and their environments.

B. Rationale

Man is a living system. Like all living systems, there are interactions that take place within us and with our surrounding environment. We are part of the ecosystem; we affect our environment by our actions just as much as changes in the environment affect us. Many of our actions have led to the destruction of habitats of other living systems, thus leading to biodiversity loss. Most Filipinos, however, lack the understanding to realize the implications of biodiversity loss. There is therefore a need to come up with a general education course that will enable the students to appreciate the underlying principles and interactions within and between living systems, and how these are related to other disciplines. The course will also help students understand how disruption of interactions could lead to vulnerability of the ecosystem and biodiversity loss. This will also allow the students to come up with an informed decision based on critical, creative and integrative thinking in addressing contemporary issues involving living systems.

C. Course Outline

1. Course Outcomes:

Upon completion of the course, students must be able to:

CO 1. Relate underlying concepts and principles of biology with other disciplines
CO 2. Analyze the interactions within and among entities in biological systems
CO 3. Utilize scientific inquiry, critical, creative and integrative thinking in making informed decisions on issues concerning living systems and their environments

Course Outcomes and Relationship to GE objectives
I *(introduced),* ***D*** *(demonstrated) or* ***R*** *(reinforced)*

Course Outcomes	GE Objectives*				
	A	**B**	**C**	**D**	**E**
1. Relate underlying concepts and principles of biology with other disciplines;	D	D	D	D	D
2. Analyze the interactions within and among entities in biological systems; and	D	D	I	I	I
3. Utilize scientific inquiry, critical, creative and integrative thinking in making informed decisions on issues concerning living systems and their environments	R	R	R	R	R

**A Broaden intellectual and cultural horizons*
B Hone critical and creative thinking
C Develop a passion for learning and scholarship
D Cultivate a high sense of intellectual and moral integrity
E Foster a commitment to nationalism and social justice

2. Course Content

Lecture Topics	No. of Hours
I. Introduction to Living Systems A. Overview of Properties and Attributes 1. Organization - levels or hierarchy of organization: molecules of life, cells, tissues, organs, organ systems, organisms, ecosystems 2. Metabolism: Energetics and Kinetics 3. Homeostasis 4. Growth and Development 5. Reproduction and Perpetuation 6. Movement and Responsiveness 7. Adaptation 8. Evolution	**6**
B. Underlying Concepts and Principles in Living Systems 1. Thermodynamics in Living Systems 2. Structure and Function Correlation 3. Self-Assembly 4. Unity in Diversity 5. Control and Regulation	**4.5**
C. The Concepts of Living Systems in Other Disciplines 1. Ecosystems as Complex Systems 2. Understanding ecosystems through computational biology 3. Concepts of adaptation, survival and extinction in other disciplines (e.g. business)	**4.5**
II. Dynamics and Interactions of Living Systems with Their Environments A. Energy Flow in Living Systems B. Biogeochemical Cycles C. Communication at Various Levels and Forms D. Dynamics in Populations	**15**

1. Population Interactions (Mutualism, Competition, Parasitism, Predator-Prey, Commensalism, Mating Behavior, Reproductive Strategies) 2. Population Change Over Time 3. Regulating Mechanisms • Negative/Positive Feedback • Disturbance, Resistance, and Resilience, 4. Patterns and Cycles 5. Social Organizations	
III. Living Systems, Society and Humanity *(include local examples)* A. Human Perceptions of Nature 1. Paradigms about the Origin of Life 2. Indigenous Knowledge and Practices 3. Ecological World Views and Philosophies, Environmental Ethics, Environmental Justice (anthropocentrism, biocentrism, eco-centrism, eco-feminism, stewardship, animal rights and welfare) 4. Representations of Life and Nature in Art B. Biodiversity, Resource Management, and Conservation	**6**
IV. Contemporary Issues on Living Systems *Must Know Topics* A. Threats to Living Systems (urbanization, pollution, population diminution and expansion, exotic and invasive species) B. Living Systems and Climate Change *Suggested Topics* A. Biotechnology 1. Food Security and Food Defense 2. Biofuels 3. Biological Warfare 4. Biomimicry, Bionics, Biomimesis 5. GMO's B. Health and Wellness 1. Emerging and Re-emerging Diseases/Epidemics 2. Biomedical Issues (one-health view, eco-health, euthanasia, ethnopharmacology, personalized medicines, stem cell research, cloning) C. Advocacies 1. Ecofeminism 2. Green Chemistry 3. Green Radicalism 4. Corporate Social Responsibility 5. Lobby System 6. Generics Medicine law D. Popular Culture Extraterrestrial Life	**9**

3. Course Coverage

Week	Course Outcome	TOPIC	Teaching and Learning Activities	Assessment Tools
1-5	• Describe the properties and attributes of living systems • Explain underlying principles and concepts in living systems • Examine structure and function correlation	**I. Introduction to Living Systems**	• Class discussions • Problem sets • Concept maps to illustrate a concept/principle	• Exams • Quizzes
76-10	• Discuss the interactions among living entities within ecosystems • Illustrate how biotic and abiotic factors affect the dynamics of the interactions between and among living systems	**II. Dynamics and Interactions of Living Systems with Their Environments**	• Reports • Case studies • Field activities • Concept maps showing how interactions occur within ecosystems • Small discussion groups	• Exam
11-12	Integrate the relationships between and among living systems, society and humanity	**III. Living Systems, Society and Humanity**	• Paper critiques • Journal reports • Small discussion groups	• Exams • Work-sheets
13-15	• Examine various contemporary issues on living systems • Construct an informed opinion or a stand on various contemporary issues related to living systems	**IV. Contemporary Issues on Living Systems**	• Case studies • Group reports • Critiques • Small discussion groups • Debates	• Projects • Capstone projects

4. Course Requirements

- Class discussions
- Problem sets
- Concept maps to illustrate a concept/ principle
- Reports, case studies/field activities
- Small discussion groups/debates
- Quizzes/ exams

REFERENCES

Campbell, N., Mitchell, L., Reece, J., Taylor, R. and Simon E.J. 2014. Biology: Concepts and Connections. 10th Ed. Benjamin Cummings

Hoefnagels, M. Biology: Concepts and Investigations, 2nd ed. 2012. McGraw-Hill.

Marten, Gerald G. 2001. Human Ecology: Basic Concepts for Sustainable Development. Earthscan Publications.

Starr, C. and Taggart, R. 2009. Biology: the Unity and Diversity of Life. 12th Ed. Brooks/Cole