



DEPARTMENT OF BIOLOGY, COLLEGE OF SCIENCE
UNIVERSITY OF THE PHILIPPINES BAGUIO

*Iskolar ng Bayan Building, University of the Philippines Baguio, Baguio City 2600
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CRE 224:

Biological Response to Environmental Stress

COURSE SYLLABUS

1st SEMESTER | AY 2023-2024 (1231)

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APPROVED ACADEMIC CALENDAR

UNIVERSITY OF THE PHILIPPINES BAGUIO PROPOSED ACADEMIC CALENDAR ACADEMIC YEAR 2025-2026



Office of the Secretary
of the University and of
the Board of Regents
**OFFICIAL
RELEASE**

Date: 11 MAR 2025

As of 18 February 2025	FIRST SEMESTER (Aug – Dec 2025)	SECOND SEMESTER (Jan – May 2026)	MIDYEAR (June – July 2026)
Deadline for filing application for transfer, appeal for readmission and extension for MRR	20 Jun, Fri	01 Dec, Mon	
ADVANCE REGISTRATION OF FIRST YEAR STUDENTS	09 Jul, Wed – 11 Jul, Fri		
Removal examination period	21 Jul, Mon – 01 Aug, Fri	18 Dec, Thu – 09 Jan, Fri	27 May, Wed – 08 Jun, Mon
Validation for advanced credits	21 Jul, Mon – 19 Aug, Wed	18 Dec, Thu – 21 Jan, Wed	27 May, Wed – 16 Jun, Tue
UP College Admission Test (UPCAT)	02 Aug, Sat – 03 Aug, Sun		
Faculty Orientation	01 Aug, Fri		
GENERAL REGISTRATION			09 Jun, Tue
Graduating students (4 th , 5 th , 6 th Year etc.)	04 Aug, Mon, a.m.	12 Jan, Mon, a.m.	
All others	04 Aug, Mon, p.m. – 06 Aug, Wed	12 Jan, Mon, p.m. – 14 Jan, Wed	
Last day of registration	05 Aug, Wed	14 Jan, Wed	
START OF CLASSES	07 Aug, Thu	15 Jan, Thu	10 Jun, Wed
WELCOME ASSEMBLY FOR FIRST YEAR STUDENTS	11 Aug, Mon		
Deadline for Change of Matriculation	15 Aug, Fri	23 Jan, Fri	11 Jun, Thu
Deadline for filing application for graduation	28 Aug, Thu	05 Feb, Thu	15 Jun, Mon
UP Foundation Day			18 Jun, Thu
Deadline for Colleges to submit to OUR tentative list of candidates for graduation	04 Sept, Thu	12 Feb, Thu	22 Jun, Mon
MID-SEMESTER	08 Oct, Wed	14 Mar, Sat	26 Jun, Fri
Wellness Break	28 Oct, Tue – 30 Oct, Thu	30 Mar, Mon – 01 Apr, Wed	
DEADLINE FOR DROPPING SUBJECTS	10 Nov, Mon	17 Apr, Fri	06 Jul, Mon
DEADLINE FOR FILING LEAVE OF ABSENCE	18 Nov, Tue	29 Apr, Wed	08 Jul, Wed (for enrolled students only)
Curriculum Committee Meeting	24 Nov, Mon	20 Apr, Mon	
UP Baguio Foundation Day	02 Dec, Tue		
END OF CLASSES	03 Dec, Wed	16 May, Sat	14 Jul, Tue
Integration Period	04 Dec, Thu	18 May, Mon	
FINAL EXAMINATIONS	05 Dec, Fri – 12 Dec, Fri		16 Jul, Thu – 17 July, Fri
Graduating students		19 May, Tue – 21 May, Thu	
Other students		19 May, Tue – 26 May Tue	
Paskihasan	12 Dec, Fri		
Araw ng Parangal and Community Lunch	15 Dec, Mon		
DEADLINE FOR SUBMITTING GRADES	20 Dec, Sat		22 Jul, Wed
Graduating students		29 May, Fri	
Other students		03 Jun, Wed	
Last day for graduating students to file permit for completion/removal	09 Jan, Fri		31 Jul, Fri
Last day for graduating students to submit requirements for academic deficiencies (INCs/4.0s) incurred in previous semesters	09 Feb, Mon	04 Jun, Thu	14 Sept, Mon
Last day for faculty to submit grades of graduating students who cleared their academic deficiencies (INCs/4.0s) incurred in previous semesters	16 Feb, Mon	11 Jun, Thu	21 Sept, Mon
College Faculty Meeting to approve candidates for graduation	16 Feb, Mon	11 Jun, Thu	21 Sept, Mon
Deadline for Colleges to submit APPROVED list of candidates for graduation	19 Feb, Thu	17 Jun, Wed	23 Sept, Wed
UNIVERSITY COUNCIL MEETING	23 Feb, Mon	19 Jun, Fri	28 Sept, Mon
BOR MEETING TO APPROVE GRADUATION	Per BOR schedule	Per BOR schedule	Per BOR schedule
COMMENCEMENT EXERCISES		30 Jun, Tue	

HOLIDAYS IN ACADEMIC YEAR 2025-2026			
2025		2026	
Ninoy Aquino Day	21 Aug, Thu	New Year's Day	01 Jan, Thu
National Heroes Day	25 Aug, Mon	Chinese/Lunar New Year	17 Feb, Tue
Baguio Charter Day	01 Sept, Mon	Masunday Thursday	02 Apr, Thu
Commemoration of the 1986 Sigat Peace Talks	13 Sept, Sat	Good Friday	03 Apr, Fri
All Saints Day Eve	31 Oct, Fri	Black Saturday	04 Apr, Sat
All Saints Day	01 Nov, Sat	Araw ng Kagitangan	09 Apr, Thu
Bonifacio Day	30 Nov, Sun	Labor Day	01 May, Fri
Feast of the Immaculate Conception of Mary	08 Dec, Mon	Independence Day	12 Jun, Fri
Christmas Eve	24 Dec, Wed	Cordillera Day	15 Jul, Wed
Christmas Day	25 Dec, Thu	Eid al-Fitr	as per official declaration
Rizal Day	30 Dec, Tue	Eid al-Adha	as per official declaration
Last Day of the Year	31 Dec, Wed		

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ABOUT UP BAGUIO

The University of the Philippines (UP) was founded in 1908 with its first campus in Manila. Its foundation was then followed soon after by the establishment of constituent units (CUs) and campuses that are strategically located all over the country. In over a century, UP has established eight constituent Universities from its 17 campuses.

The University of the Philippines Baguio (UP Baguio) began as the University of the Philippines College of Baguio (UPCB) (among the growing number of UP campuses in the Philippines), UPCB was established through the initiative of UPCB Alumni in Baguio, Benguet in 1961. UP Baguio became the 7th constituent university of the UP system in 2002 with a goal to be a hub of knowledge generation and human resource training and development in Northern Luzon.

UP Baguio takes pride in its contribution in nurturing and developing innovative programs in the arts and sciences as it continues to develop the niche it has created over the past decades - Cordillera studies.

Vision

The University of the Philippines envisions itself as a leading regional and global university in an environment that sustains 21st century learning, knowledge creation, and public service for society and humanity. As a constituent of the University of the Philippines System, UP Baguio will sustain its lead position in the delivery of tertiary education in the North.

UP Baguio will continue to nurture and develop innovative programs in the arts and sciences. It will also continue to develop the niche it has created over the past decade in Cordillera Studies.

Mission

Our mission, therefore, as a unit of the UP system and as the leading institution of higher learning in Northern Luzon, is to spearhead the offering of the highest standard of education and to contribute to the overall upgrading of the quality of instruction in the region.

We seek to create an impact by informing our students with a regional perspective, while they are informed with a national and global outlook.

Objectives

Based on the vision, the mandate, and the mission of the university in knowledge creation and public service, four goals were derived:

1. To contribute to national development by building expertise in different fields through the developing and strengthening of academic programs and research policies;
2. To optimize the use of resources through adequate budgetary and policy support, alumni support, and innovation of resource generation;
3. To promote equity amidst diversity in the efforts to achieving excellence and internationalization; and
4. To strengthen and enhance human resource management and promotion systems for the improvement of the welfare of constituents.

ABOUT THE COLLEGE OF SCIENCE

Subsequent to the reorganization of UP Baguio after its institution as the 7th constituent university of the UP system in 2002, the College of Science (CS), being one of the three colleges emerging from the reorganization, evolved from the merger of the Division of Natural Sciences and Mathematics and the Sports, Physical Education and Recreation Division.

The College offers four undergraduate programs, such as the BS Mathematics, BS Biology, BS Computer Science, BS Physics, and three graduate degree programs, namely, Master of Science in Conservation and Restoration Ecology (MS CaRE), Master of Science in Mathematics, and Doctor of Philosophy in Mathematics. All of these programs are regularly reviewed and upgraded to prepare students for careers in education, research, and/or postgraduate studies.

Vision

The College of Science aims to continue offering high standard and relevant quality education through good practices in program implementation that follows innovative pedagogical strategies that utilizes appropriate technology in supporting this endeavor.

It will further its objectives by initiating interdisciplinary programs anchored on disciplinary specializations in its efforts to enhance efficiency of research conduct and management.

It will continue to encourage and reward scientific productivity by conducting researches responsive to the needs of the region, nation and the global community.

The college envisions itself moving towards a more inclusive and equitable environment that enables faculty members to lead on with exemplary qualifications – mindful of scholarly research and dedicated to public service.

Furthermore, it will support UP Baguio's wellness program for both academic and support staff to guarantee efficiency in service to the university and the society.

Lastly, the college, together with the university, will take initiative to continue, strengthen and widen the reach of its involvement in public service by sharing individual and collective expertise with other academic institutions, local government units, Non-Government Organizations (NGOs), peoples' organizations and indigenous communities in the region and other areas.

Mission

In line with the vision of the College, it is our mission, therefore, to produce scientific leaders and civic-minded citizens with high regard for integrity, compassion, and genuine service who lead in research study that follows ethical standards and excellence in instruction, research and public service.

It is our mission to improve on basic facilities and design where researchers can work more collaboratively and efficiently.

We pursue to guarantee the safety of researchers, to minimize adverse impact to the environment, to respect research protocols involving indigenous communities, and to ensure professional conduct as we encourage good instruction, research and public service in upholding the University's banner of honor and excellence.

Objectives

In accordance to the mission and vision of the University, the college aims to accomplish the following objectives:

1. To continue in formulating new degree programs while sustaining the old ones;
2. To encourage interdisciplinary researches across programs;
3. To institutionalize the Science Research Center (SRC) in continuing research responsive to the need of the region, and in the enhancement of interdisciplinary collaboration within the departments of the College and even with other faculty members in other Colleges of the UP Baguio;
4. To have a closer linkage with the UP Baguio Cordillera Studies Center (UP Baguio- CSC) as the University's research center and as an aide in putting up the Biodiversity and Innovation Research center;
5. To foster an environment suitable for the growth of the academic and support staff; and,
6. To provide public service based on each academic and support staff's specialization.

ABOUT THE DEPARTMENT OF BIOLOGY

The Department of Biology emerged from being a Discipline under the then Division of Natural Sciences and Mathematics in 2002. Currently, it offers a Bachelor's degree in Biology, and a Master's degree in Conservation and Restoration Ecology (MS CaRE).

The BS Biology is a four-year program with a thesis requirement. It provides thorough grounding in the biological sciences by:

- Instilling among the students important biological principles, theories, concepts and methods;
- Keeping them abreast with the latest developments in Biology and Allied Sciences
- Honing their research skills in the field and in the laboratory; and
- Inculcating in them a scientific and ethical culture of science.

The BS Biology program offers three Areas of Concentration: General Biology, Ecology & Systematics, and Microbiology.

Vision

Aligned with the goals of the College of Science and the University of the Philippines Baguio, the vision of the Department of Biology is to be a leader in academic excellence, research, and community involvement in Northern Luzon. We envision to be an active contributor to the university's commitment to deliver high-quality education by maintaining responsive curricula and instituting relevant academic programs integrating perspectives rooted in specific disciplines in biology. The department aspires for a more inclusive and equitable academic environment empowering teaching staff, personnel, and students to better engage in scholarly work, interdisciplinary research, and public service.

Mission

The Department of Biology commits to develop, adopt, and employ best practices in innovative pedagogies and technologies in scientific inquiry. We strive to generate knowledge through interdisciplinary research rooted in biology disciplines. We pursue a vibrant academic environment that produces researchers, professionals, and scientific leaders competent and equipped to responsibly and ethically address and manage environmental and health challenges. We extend our service to the public by sharing individual and collective expertise with various educational institutions, local government units, non-governmental organizations, peoples' organizations, and indigenous communities in the Cordillera Administrative Region and the rest of Northern Luzon.

COURSE DESCRIPTION AND REQUIREMENTS

About the Instructor



Faculty member in charge	Contact details
Roland M. Hipol, PhD <i>PhD Botany</i> Professor of Biology Department of Biology College of Science University of the Philippines Baguio	Email address: rmhipol@up.edu.ph

Course Details

Course Number:	CRE 224
Course Title:	Biological Responses to Environmental Stress
Course Description:	Stress is an inevitable component of any environment that results in less than optimal growth of the organisms. In this course, students will be presented with various environmental stresses, which will also be discussed. The interrelationships between the stresses and the related responses will be focused on as the organism and the species to which it belongs survive and evolve.
Prerequisite:	Animal/Plant or any Physiology course/ equivalent
Semester/s Offered:	1/2
Course Credit:	3 units
Number of Hours:	2 hours lec, 3 hours lab

Course Requirements

Lecture: 70%

Written examinations	60%
Written Journal Report	20%
Oral presentation of Journal Report	20%

Laboratory: 30%

Review Paper/ Special Problem	60%
Laboratory Exercises	40%

Program Learning Outcomes (PLOs)

The Program Learning Outcomes (PLO) of the MS CaRE Program are as follows:

PLO 1	To demonstrate genuine concern and passion for environmental issues that have impacts on species, ecosystems, and people
PLO 2	To practice professional and ethical integrity in diverse social and academic settings
PLO 3	To generate knowledge through independent transdisciplinary research
PLO 4	To communicate scientific outputs to key stakeholders and the general public

PLO 5	To assess ecological patterns and processes through rigorous and ethical scientific inquiry that supports evidence-based predictions for conservation and restoration decisions
PLO 6	To design a framework that can influence research and policies on the conservation and restoration of species, habitats, and ecosystems
PLO 7	To utilize immersive ground-truthing as a mechanism to ensure conservation and restoration interventions are both scientifically robust and socioculturally situated
PLO 8	To establish linkages with local communities, academia, non-government organizations, and government agencies in support of conservation and ecological restoration.
PLO 9	To integrate multidisciplinary approaches, local and indigenous knowledge systems, and community partnerships to consistently champion conservation and restoration across diverse ecosystems.
PLO 10	To adhere and commit to a life-long application of evolving ecological knowledge and collaborative practices to advance conservation and restoration efforts
PLO 11	To embody competence in ecological stewardship and sustainable resource management

Course Learning Outcomes (CLOs)

At the end of this course, the student should be able to:

CLO 1	Describe the different stressful conditions that have an impact on the survival, growth, and reproduction of organisms
CLO 2	Explain the responses of the organisms specific to the different environmental stressors
CLO 3	Relate the different stresses to each other and to the different responses observed in the organism and in the species
CLO 4	Analyze scientific papers published in reputable journals and come up with a report and/or oral presentation
CLO 5	Design and propose an experiment on any topic on organism stress response and write a scientific report the results of this experiment of Special Problem
CLO 6	Develop a review paper summarizing recent information regarding specific stresses or specific organisms of interest
CLO 7	Appreciate the role of environment stress (biotic and abiotic) in the biology of the individual and in the evolution of the species to which it belongs.

Mapping of CLOs with PLOs

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11
CLO 1				F							I
CLO 2											I
CLO 3				M							I
CLO 4		I		I	I					I	I

CLO 5	M	I	M	M		M			M	M	I
CLO 6	F	I								M	I
CLO 7	F			I							I

LEGEND: I-Introduced; M-Moderately achieved; F-Fully achieved

Class Rules

1. Students are allowed a maximum of three (3) absences or 20% of the total number of meetings for the entire semester; otherwise, the student will be required to drop the course (Article 346 of the University Code).
2. Students who miss class requirements will get a grade of zero unless their reasons are valid (with proper documentation). Make-up activities shall be given as soon as possible.
3. Students must actively participate in the class discussion.
4. Cheating, in any form, will warrant you a grade of 5.0 in this course or expulsion from the University. Declare and properly cite AI-generated content for course requirements to avoid plagiarism. Disclose the use of AI in data collection activities.

Grading Scheme

Grade	Equivalent	UP Classification	Grade	Equivalent	UP Classification
96 – 100	1.00	Excellent	65 – 69	2.75	Satisfactory
93 – 95	1.25	Excellent	60 – 64	3.00	Passing
89 – 92	1.50	Very Good	55 – 59	4.00	Conditional
85 – 88	1.75	Very Good	Below 55	5.00	Fail
80 – 84	2.00	Good	DRP		Dropped
75 – 79	2.25	Good	INC		Incomplete
70 – 74	2.50	Satisfactory			

Course Outline

TIMELINE	CLO	Topic	Teaching and Learning Activities	Assessment Tool
Weeks 1-2	CLO 1 CLO 4 CLO 5 CLO 6 CLO 7	I. Introduction and General Concepts A. Biological Stress Concepts B. Abaptation: The Evolution of Suites of Traits C. Adaptation and Habituation: Functional Changes in Phenotype D. Effect of Stress on the Distribution Pattern of Organisms 1. Natural Distribution of Organisms along Environmental Gradients 2. Altered Distribution of Organisms along Gradients of Environmental Stress <i>This chapter will introduce the concept of stress and how these affects organisms in general. It will also introduce the concept of abaptation, adaptation, and habituation- concepts commonly associated with the responses of organisms to less-than-optimal conditions. It will also introduce the impact of stress on the distribution of organisms along gradients of the different environmental stresses.</i>	• Lectures • Case study/scientific paper analysis	• Quiz • Class participation • Laboratory exercises • Written examination

Weeks 3-6	CLO 2 CLO 3 CLO 4 CLO 5 CLO 6	II. Responses to Abiotic Environmental Stressors A. Responses to High Energy and High Light Intensity B. Responses to Extremes in Temperature C. Responses to Nutrient and Water Deficiency D. Responses to Environmental Pollutants <i>This chapter will discuss the specific abiotic stresses that impact organisms and their appropriate responses. These factors include light, temperature, nutrient and water availability, and environmental pollutants.</i>	• Lectures • Student-led discussion • Case study/scientific paper analysis • Journal report	• Quiz • Written journal report • Laboratory exercises • Written examination
Weeks 7-8	CLO 2 CLO 3 CLO 4 CLO 5 CLO 6	III. Responses to Parasites, Pathogens, and Diseases A. Parasites and Pathogens as Agents of Stress B. Persistent Infestations/Infections and Diseases C. Newly Emerging Diseases <i>This chapter will discuss the different biotic factors that affect organisms, including parasites and pathogens, which may be manifested as disease. Examples of organismal responses to these will be discussed.</i>	• Lectures • Student-led discussion • Case study/scientific paper analysis • Journal report	• Quiz • Written journal report • Laboratory exercises • Written examination
Week 9	Reading and Wellness Break			
Week 10	CLO 3 CLO 4 CLO 5 CLO 6	IV. Cross-tolerance: Preparation for Further Stress A. Concept of Cross-tolerance B. Case Studies <i>This chapter will illustrate the complexity of relationships among the different responses of organisms to different stresses.</i>	• Lectures • Student-led discussion • Case study/scientific paper analysis • Journal report	• Quiz • Written journal report • Laboratory exercises • Written examination

Week 11-12	CLO 4 CLO 5 CLO 6 CLO 7	V. Environmental Stresses as Driving Force and Key Player in Evolution A. Environmental and Epigenetic Mechanisms B. Hormesis <i>This chapter will highlight the role of environmental stress as a factor in the evolutionary history of species.</i>	• Lectures • Student-led discussion • Case study/scientific paper analysis • Journal report	• Quiz • Written journal report • Laboratory exercises • Written examination
Week 13	Oral Presentation of Journal Report			
Weeks 14-16	Review Paper/Special Problem			

List of References/ Readings

(to be updated yearly)

Kaur, T., & Arora, S. (2021). *Environmental stress physiology of plants and crop productivity*. Bentham Science Publishers. <https://doi.org/10.2174/97816810879001210101>

Somero, G. N., Lockwood, B. L., & Tomanek, L. (2017). *Biochemical adaptation: Response to environmental challenges from life's origins to the Anthropocene*. Sinauer Associates / Oxford University Press.

Taiz, L., Møller, I. M., Murphy, A., & Zeiger, E. (2022). *Plant physiology and development* (7th ed.). Oxford University Press.

Willmer, P., Johnston, I. A., & Stone, G. (2000). *Environmental physiology of animals* (2nd ed.). Blackwell Science.

Peer-Reviewed Review Articles

Fulda, S., Gorman, A. M., Hori, O., & Samali, A. (2010). Cellular stress responses: Cell survival and cell death. *International Journal of Cell Biology*, 2010, 1–23. <https://doi.org/10.1155/2010/214074>
Cited by: 2088

Özbey, N. P., Thompson, M. A., & Taylor, R. C. (2021). The regulation of animal behavior by cellular stress responses. *Experimental Cell Research*, 405(2), Article 112720. <https://doi.org/10.1016/j.yexcr.2021.112720> Cited by: 13

Rossnerova, A., Izzotti, A., Pulliero, A., Bast, A., Rattan, S. I. S., & Rossner, P. (2020). The molecular mechanisms of adaptive response related to environmental stress. *International Journal of Molecular Sciences*, 21(19), Article 7053. <https://doi.org/10.3390/ijms21197053>

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Prepared by:

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