

Department of Biological Sciences
DEGREE PROGRAMS
CURRICULUM

DOCTOR OF PHILOSOPHY IN BIOLOGY

Introduction

The Mindanao State University has long been recognized as the premier university in the Southern Philippines. The various curricula offered by its seven autonomous campuses sufficiently provide an answer to the varied manpower needs of the Mindanao-Sulu-Palawan (MISUP) Region. MSU-Iligan Institute of Technology, in particular, has been identified as a center of excellence in various disciplines of science and technology. It is expected to continuously provide training development of manpower resources in the region through its undergraduate and graduate programs.

The Commission on Higher Education (CHED) through the Mindanao Advanced Education Project (MAEP) identified MSU-Iligan as a graduate center for several disciplines in the area of the sciences including biology. It is geared towards substantial improvement in the manpower capability in the college-graduate levels in various institutions in Mindanao. MAEP provides financial assistance and scholarships to some faculty members from these institutions to pursue advanced degrees either M.S. or Ph.D.

At present, MSU-Iligan in consortium with MSU-Marawi is offering the M.S. Biology program. Considering the strong faculty profile, adequate laboratory and library facilities of the Department of Biological Sciences in both campuses, it is deemed appropriate that the university through MSU-Iligan Institute of Technology (MSU-IIT) will offer the Doctor of Philosophy (Ph.D.) in Biology with majors in Molecular Biology, Microbiology, Genetics and Environmental Biology. In doing so, the Mindanao State University can answer the demand for advanced training in teaching and research capabilities in the region.

Objectives

It is envisioned to develop the manpower resources in the MISUP Region, the Ph.D. (Biology) program shall:

1. provide advanced formal training for instruction and research capabilities in the area of biological sciences and
2. fill the need for highly trained biologists in the government, private industries and academic sectors in the region.

Admission Requirements

1. Admission to the Ph.D. (Biology) Program shall require:
 1. a B.S. degree in biological science or allied fields from a recognized institution of higher learning with a grade point average (GPA) of 3.4 or better (for the MS-Ph.D. direct program).
 2. a M.S. degree in biological science or allied fields from a recognized institution of higher learning with a grade point average (GPA) of 3.4 or better in the M.S. degree (for the regular program).
 3. three (3) letters of recommendation from former professors-immediate supervisor attesting to the student's intellectual capacity for advance studies.
 4. satisfaction of the School of Graduate Studies-institute's admission requirements.

Probationary, conditional or special admission may be granted to applicants with a degree in advanced science or related field.

.io	382	! dvanced *evelopmental .iology	5 units
.io	38<)volutionary .iology	5 units
.io	392	! dvanced 'ell and Molecular .iology	5 units

. . Specialty)lectives (37 units from any of the fields of specialization!)nvironmental .iology% , enetics%

7.	M	345	Marine Microbiology	5 units
	M	347	Industrial Microbiology	5 units
	M	348	Food Microbiology	5 units
	M	349	Determinative Bacteriology	5 units
	M	340	Microbial Toxins	5 units
	M	341	Microbiological Techniques	5 units
	M	342	Immunology	5 units
	M	324	Epidemiology	5 units
	M	332	Microbial Ecology	5 units
	M	372	Microbial Physiology	5 units
	M	332	Microbial Genetics	5 units
	M	334	Special Topics	5 units
	M	332	Special Problems	5 units
1.	Graduate Seminar (5 units from 5 one-unit seminar courses.)			
		338	Seminar in Microbiology	2 unit
*	Doctoral Dissertation (23 units)			
		744	Doctoral Dissertation	23 units

Other Requirements

2. After completion of all core courses with a GPA of 3.4 or better by a student entering the program with a B.S. degree or after validating the core courses or their equivalents for students entering with a M.S. degree, the student takes a qualifying (written) examination which will be the basis for evaluating his/her ability to pursue doctoral studies. A committee of at least three members to be formed by the Ph.D. Biology Program Committee shall prepare and administer the examination.
3. After passing all specialty courses (based on the program study with a weighted average of 3.4 or better) the student takes an oral specialty examination which will be given by his advisory-guidance committee. A dissertation proposal is a requirement for the specialty examination.
5. Final Examination (Oral defense of dissertation before the advisory committee).
7. In the event a student entering the program fails in the qualifying (written) examination twice, the Ph.D. Biology Program Committee may recommend that the student take at least nine units of specialty courses and conduct a thesis leading to a M.S. degree or the student be dismissed from the program.

Plan of Study, Ph.D. Bio-
 ("STPA" Use of Sedimentation)

MASTER SCIENCE I BIOLOGY

Introduction

The program leading to the degree of M.S in Biology was instituted at the Iligan Institute of Technology of the Mindanao State University in 2003. It aims to

provide Mindanao, Sulu and Palawan (MOSUP) regions a graduate program in the highest level envisioned to be a strong catalyst in the development of biological education, research and extension services

provide the manpower needs of the region in general and the Magayan-Iligan Corridor (MIC) area in particular to address problems of biological significance such as abuse of natural resources, pollution, increased demand for food resources, and disease prevention and control in man, livestock and agricultural crops

produce highly trained biologist with a strong biotechnological foundations who will bring the Philippines to a newly industrialized country (NIC) status by increasing productivity and making the quality of biotechnologically processed goods competitive in the world market.

Admission Requirement

Applicants for admission to the program must fulfill the following requirements:

2. Hold a baccalaureate degree in Biology or in any of the allied fields from a recognized institution.
3. Have a background in each of the following areas of study:

a# Taxonomy

b# Morphology

c# Ecology

d# Physiology

e# Genetics

f# Inorganic Chemistry

g#

b. Major courses (32 units of major courses apportioned in at least three areas) in any three of seven areas including General Biology or eighteen (29# units of major courses apportioned similarly plus three (5# units of a graduate course in biochemistry, marine biology, fisheries, agriculture, statistics or computer science, preferably one that is directly related to the student's thesis.

		T!D?0?M@	
.ot	322	Advanced Plant Systematics	5 units
Boo	322	Advanced Animal Systematics	5 units
		M?\$P(?"",@	
.ot	353	Morphology of Higher Vascular Plants	5 units
.ot	355	Morphology of Thallophytes	5 units
Boo	3<2	Comparative Histology of Vertebrates	5 units
		*)>)"?PM)0T!" . ?"?,@	
.io	383	Cell Differentiation in Embryonic Systems	5 units
.ot	383	Plant Growth and Development	5 units
Boo	385	Experimental Embryology	5 units
		P(@S ?"?,@	
.io	379	Radiation Biology	5 units
.ot	372	Advanced Plant Physiology	5 units
.ot	373	Plant and Eater Relations	5 units
M'.	373	Microbial Physiology	5 units
Boo	375	Comparative Endocrinology of Vertebrates	5 units
Boo	377	Physiology	5 units
Boo	37<		5 units
)'?"?"	
.io		Genetics	5 units
		Genetics of Evolution	5 units
		Population Genetics	5 units
		Genetics of Eukaryotes	5 units
		Microbial Genetics	5 units
	5	Terrestrial Ecology	5 units

3. A grade of 3.4 or better in a graduate or undergraduate course that is included in the student's approved program of study shall be given credit.
5. Comprehensive Examination- The comprehensive examination will cover all graduate courses taken by the student.

Departmental Requirements

,) 0) \$! " . ? " ? , @

.io	39<	! dvanced Theoretical . iology	5 units
.io	399	' riti/ue in)volution	5 units
.io	39;	Philippine . iology	5 units
.io	3;5	. iometry	5 units
.io	3;7	. ioethics	5 units
.io	3;=	ndividual Studies	5 units
Boo	334	?rnithology	5 units

c- Master's Thesis ,8 \$nits.

.io	544	Master's Thesis	8 units
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- =. ! grade of 3.4 or better in a graduate or undergraduate course that is included in the student's approved program of shall be given credit.
- 8. ' omprehensive)&amination- The comprehensive e&amination will cover all graduate courses ta:en by the

Second Year Summer

- i. Organic Chemistry
- ii. Inorganic Chemistry

Degree Requirements

To qualify for the Master of Science degree, a student must successfully complete a minimum of 5 units of course work specified in his program of study with a grade point average of 3.4 or better.

Departmental Requirements

Courses in program can be classified into seven areas, namely: Taxonomy, Developmental Biology, Physiology, Genetics, Ecology, Cell Biology and, General Biology.

A- Core Courses, 10 units.

BIOL 322 Advanced Systematics	5 units
BIOL 332 Advanced Ecology	5 units
BIOL 372 Advanced Physiology	5 units
BIOL 3=2 Advanced Genetics	5 units
BIOL 382 Advanced Developmental Biology	5 units
BIOL 392 Advanced Cell and Molecular Biology	5 units
BIOL 3;2 Special Problem	5 units
BIOL 3;8 Seminar in Biology	2 unit

B- Major Courses

BIOL 335 Terrestrial Ecology	5 units
BIOL 337 Freshwater Ecology	5 units
BIOL 354 Problems in Environmental Biology	5 units
BIOL 379 Radiation Biology	5 units
BIOL 37; Biology of Symbiosis	5 units
BIOL 3=4 Radiation Ecology	5 units
BIOL 3=3 Advanced Cytogenetics	5 units
BIOL 3=5 Molecular Genetics	5 units
BIOL 3== Genetics of Evolution	5 units
BIOL 3=8 Population Genetics	5 units
BIOL 3=< Genetics of Microorganisms	5 units
BIOL 383 Cell Differentiation in Embryonic Systems	5 units
BIOL 38< Evolutionary Biology	5 units
BIOL 39< Advanced Theoretical Biology	5 units
BIOL 399 Evolution in Action	5 units
BIOL 39; Philippine Biology	5 units
BIOL 32= Botany	5 units
BIOL 33< Phytogeography	5 units
BIOL 353 Morphology of Higher Vascular Plants	5 units
BIOL 355 Morphology of Thallophytes	5 units
BIOL 372 Advanced Plant Physiology	5 units
BIOL 373 Plant and Eater Relations	5 units

2.

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MASTER OF SCIENCE IN MARINE BIOLOGY

Introduction

The Master of Science in Marine Biology is a consortium program of the Federation of Institutions for Marine and Freshwater Sciences.

Objectives

2. To establish an independent center for the development of instruction, research, and extension program in Marine Sciences in the Visayas and Mindanao.
3. To upgrade manpower and facilities of member institutions enabling them to offer a graduate program at the masteral level and ultimately to aptly provide them with the capabilities to develop an internationally recognized institution offering a Ph.D. degree program.
5. To promote an atmosphere of cooperation and coordination among member institutions concerned with the development of marine science.
7. To provide a channel to share and exchange physical and human resources in areas of common interests in marine science among member institutions.

III.

Admission Requirements at MSU-IIT

1. Admission on a regular status to the M.S. in Marine Biology program requires:

2. Possession of a B.S. Marine Biology degree or a baccalaureate degree in biology, Botany, Zoology, Fisheries and related fields with completion of the following courses:

		Oceanology	7 units
		Marine Plants- Algae	7 units
		Marine invertebrate	7 units
7 units	7 units	Marine vertebrates	7 units

3. Minimum grade point average of 3.0 (or its equivalent) or better in the undergraduate degree.
5. Two letters of recommendation from former instructors in undergraduate major (marine biology) courses attesting to the student's intellectual capacity for graduate studies in marine biology.

Probationary admission may be given to the candidate who has completed the requirements for admission to the M.S. in Marine Biology program but who does not meet the above-mentioned requirements.

M . 339	Marine Productivity	5 units
M . 33;	Marine Pollution	5 units
M . 374	Marine Toxicology	5 units
M . 372 !	Morphology and Physiology of Marine Animals	

Second Year Summer

Course No.	Course Title	Units	Credits			Prerequisites
			Sec	Lab	Total	
M . 544	Masteral Thesis					
	Total					

Third Year First Semester

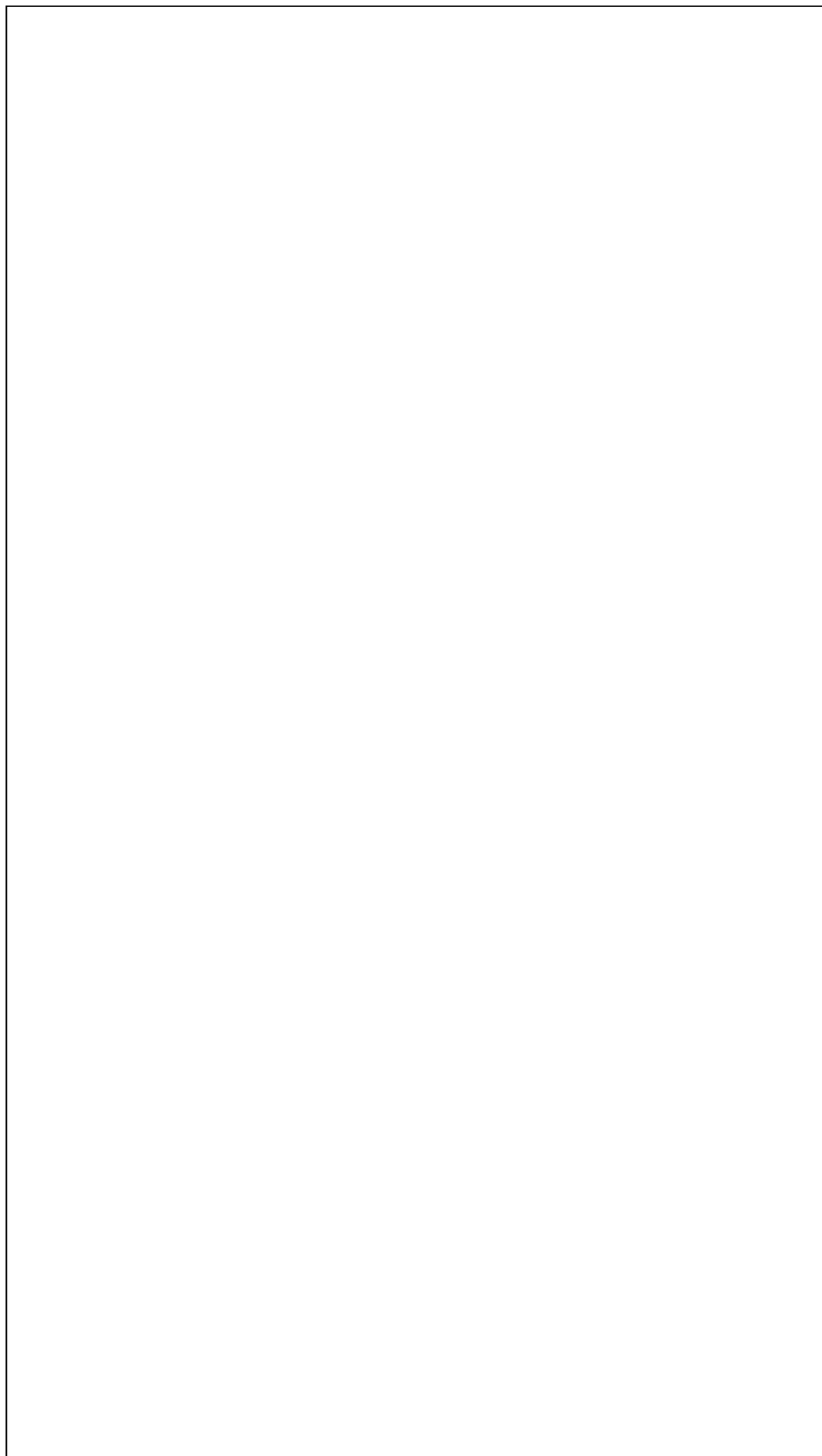
Course No.	Course Title	Units	Credits			Prerequisites
			Sec	Lab	Total	
M . 544	Masteral Thesis					
	Total					

Third Year Second Semester

Course No.	Course Title	Units	Credits			Prerequisites
			Sec	Lab	Total	
M . 544	Masteral Thesis					
	(Thesis Defense)GG					

May be taken in the first semester of the second year

May be enrolled-conducted either in the first or second semester-summer term



(Nine units of the following required courses plus 6 units of free electives. Qualified students who would be focusing on either Chemistry or Biology are required to enroll in elective courses relevant to their focus

Code	Course Name	Units	Prerequisites	Grading	Total
ENSC 348	Environmental Impact Assessment	7	3	8	9
Total		7	3	8	9

Second Year First Semester

Prere/uisite(s# 1 . io 24< (, eneral)cology# or its e/uivalent.

. ? 335 T)\$)\$ST\$!")' ?" ? , @
Composition and dynamics of terrestrial communities-ecosystems.
'redit 15 units

Prere/uisite(s# 1 . io 24< (, eneral)cology# or its e/uivalent.

. ? 337 A)\$S(E !T)\$)' ?" ? , @
Composition and dynamics of terrestrial communities-ecosystems.
'redit 15 units

Prere/uisite(s# 1 . io 24< (, eneral)cology# or its e/uivalent.

. ? 33= P?PU"!T ?0)' ?" ? , @
Principles on dynamics of population; causes of rise and fall in numbers of population; regulation and management of population.

'redit 15 units

Prere/uisite(s# 1 . io 24< (, eneral)cology# or its e/uivalent.

. ? 338 !*>!0')* M)T(?*S 0)' ?" ? , '!" \$)S)!\$ '(
Analytical tools and research approach in the study of populations, communities and ecosystem.

'redit 15 units

Prere/uisite(s# 1 . io 24< (, eneral)cology# or its e/uivalent.

. ? 33< P(@T? ,)? , \$!P(@
)cology and distribution of plant populations on earth.

'redit 15 units

Prere/uisite(s# 1 . io 24< (, eneral)cology#. . io 24= (Systematics# recommended or their e/uivalents.

. ? 33; P?""UT ?0 . ?" ? , @
Discussions on types and causes of pollution in the environment. Methods on bioremediation and pollution control and prevention will be included.

'redit 15 units

Prere/uisite(s# 1 . io 24< (, eneral)cology# or its e/uivalent.

. ? 354 P\$? .")MS 0)0> \$?0M)0T!" . ?" ? , @

Defining some environmental problems brought up as a result of human activity. Discussion of possible abatement and control.

'redit 15 units

Prere/uisite(s# 1 ' onsent of instructor

. ? 374)0> \$?0M)0T!" T?D ' ?" ? , @

Discussions on synthesis of toxins. Includes discussions on the principles of toxicology among organisms especially animals. Identification of common environmental toxins, their mechanisms of toxication and possible cure and prevention.

'redit 15 units

Prere/uisite(s# 1 . io 24; (, eneral Physiology# and 'hem 7= () lementary . iocchemistry# or their e/uivalents.

. ? 372 !*>!0')* P(@S ?" ? , @

Recent trends and concepts in physiology with emphasis on the universal physiological principles applied to all organisms.

'redit 15 units

Prere/uisite(s# 1 . io 24; (, eneral Physiology# or their e/uivalents.

. ? 37= . ?" ? , @ ?A \$)P\$?*U'T ?0

Life cycle and reproductive process in organisms.

'redit 15 units

Prere/uisite(s# 1 . io 2=< (' omp. ! natomy and Phylogeny of >ertebrates# and . io 24; (, eneral Physiology#

. ? 378 M?")' U"! \$. ?" ? , @ ?A \$)P\$?*U'T ?0

The molecular basis of fertilization, development and differentiation of living organisms.

'redit 15 units

Prere/uisite(s# 1 . io 234 (* evelopmental . iology# or its e/uivalent.

. ? 379 \$!* !T ?0 . ?" ? , @

Effects of ionizing radiation on the different biological systems

'redit 15 units

Prere/uisite(s# 1 . iology 24; (, en. Physiology# or its e/uivalent.

. ? 37; . ?" ? , @ ?A S@M . ?S S

The different symbiotic relationships among living organisms

'reditl 15 units

Prere/uisite(s# 1 . iology 24< (, en.)cology# or its e/uivalent.

. ? 3=4 \$!* !T ? 0) ' ? " ? , @
)ffects of ionizing radiations on the environment.

'reditl 15 units

Prere/uisite(s# 1 . iology 24< (, en.)cology# or its e/uivalent

. ? 3=2 !* > ! 0 ') * ,) 0) T ' S
. iochemical and molecular basis of heredity and biotechnology.

'reditl 15 units

Prere/uisite(s# 1 . io 248 (, eneral , enetics# or its e/uivalent.

. ? 3=3 !* > ! 0 ') * ' @ T ? ,) 0) T ' S
!dvances in the study of chromosomes and their structure, behavior and their function.

'reditl 15 units

Prere/uisite(s# 1 . io 248 (, en. , enetics#

. ? 3=5 M ? ") ' U " ! \$,) 0) T ' S
Molecular mechanisms of inheritance, mutation and related processes. Topics on recombinant * 0 ! will be discussed.

'reditl 15 units

Prere/uisite(s# 1 . io 248 (, en. , enetics# # and ' hem 7= () lementary . iochemistry#

. ? 3=7 *) >) " ? PM) 0 T ! " ,) 0) T ' S
, enetics principles as applied to the development of organaisms.

'reditl 15 units

Prere/uisite(s# 1 . io 234 (* evelopmental . iology# and . io 248 (, en. , enetics# or their e/uivalents

. ? 3== ,) 0) T ' S ? A) > ? " UT ? 0
\$ole of genetic factors in evolution and speciation.

'reditl 15 units

Prere/uisite(s# 1 . io 248 (, en. , enetics# or its e/uivalentl . io 224 () volution# recommended

. ? 3=8 P ? PU " ! T ? 0 ,) 0) T ' S
Principles governing in the behavior of genes in the populations.

'redit 15 units

Prere/uisite(s# 1 . io 248 (, en. , enetics# or its e/uivalent

. ? 3=< ,) 0) T ' S ? A) U J ! \$ @ ? T) S
!dvances in the identification, characterization and manipulation of genes in eu: aryotic systems.

'redit 15 units

Prere/uisite(s# 1 . io 248 (, en. , enetics# or its e/uivalent

. ? 3=9 \$! * ! T ? 0 ,) 0) T ' S
'hange in genetic structure, manifestation and function when genes-chromosomes are e&posed to various ionizations.

'redit 15 units

Prere/uisite(s# 1 . io 248 (, en. , enetics# or its e/uivalent

. ? 382 !* > ! 0 ') * *) >) " ? PM) 0 T ! " . ? " ? , @

\$ecent concepts on the regulation of fertilization, development and differentiation.

'redits 15 units

Prere/uisite(s# 1 . io 234 (* evelopmental . iology# or its e/uivalent.

. ? 383 ') " " * AA) \$) 0 T ! T ? 0 0) M . \$ @ ? 0 ' S @ ST) MS
'urrent concepts on embryonic development.

'redit 15 units

Prere/uisite(s# 1 . iology 234 (* evelopmental . iology# or its e/uivalent

. ? 387 M ? ") ' U " ! \$. ? " ? , @ ? A , \$? ET (\$) , U " ! T ? 0
*iscussions on the molecular-cellular bases of growth and differentiation regulations.

'redit 15 units

Prere/uisite(s# 1 . io 24; (, en. Physiology# or its e/uivalent.

. ? 38<) > ? " UT ? 0 ! \$ @ . ? " ? , @

Ma+or and general concepts of evolution of organisms. *iscussions on the different theories of evolution both micro- and macro- evolution.

'redit 15 units
Prere/uisite(s# 1 'onsent of instructor

. ? 389)T("?", @

Natural history of behavior, genetics and learning on the shaping of behavior, physiological and adaptive value of behavior, mechanisms of response to environment and the adaptive ness of the behavioral response.

'redit 15 units
Prere/uisite(s# 1 'onsent of instructor

. ? 392 !*>!0')* ')" !0* M?)'U"!\$. ???, @

Recent advances in cell and molecular biology including neurobiology and techniques in molecular biology and genetic engineering.

'redit 15 units
Prere/uisite(s# 1 Bio 249 (Cell Biology# or its equivalent.

. ? 395 M?)'U"!\$. ???, @ ?AA)\$M)OT!T ?0

The physiology, biochemistry and genetics fermentation and the production of secondary metabolites and substances of economic importance.

'redit 15 units
Prere/uisite(s# 1 'onsent of instructor.

. ? 397 M?)'U"!\$. ???, @ ?AT() MMU0) S@ST)M

'redit 15 units
Prere/uisite(s# 1 'onsent of the instructor.

. ? 39=

'redit	12 unit
Prere/uisite(s#	1 'onsent of the instructor
. ? 3;=	0 * > *U! " STU*)S
!n independent research pro-ect in a specific area of study under the guidance of an appropriate faculty.	
'redit	12-8 units depending on the student and academic adviser
Prere/uisite(s#	1 0one
. ? 3;8	S)M 0!\$ 0 . ?"?, @
?ral presentation and discussion of current researches in biology	
'redit	12 unit
Prere/uisite(s#	1 0one
. ? 3;9	! * > ! 0 ') * \$)S) ! \$ > (M)T (? * ? " ? , @
Principles and methods in biological research including statistical analysis	
'redit	15 units
Prere/uisite(s#	1 Stat 55 (. iostatisticsa# or its e/uivalent
. ? 544	M ! ST) \$6S T () S S
! formal% detailed report on the research conducted based on approved thesis proposal. The research must be an original contribution to the area of specialization.	
'redit	18 units
. ? 744	* ? ' T ? \$! " * SS) \$ T ! T ? 0
Aormal% detailed report on the research conducted based on approved thesis proposal. The research must be an original contribution to the area of specialization.	
'redit	123 units (to be enrolled four times% 5 units-semester#
. ? T 32=	! HU ! T ' . ? T ! 0 @
dentification% classification and biology of a/uatic plants% including the algae% in both fresh and marine waters	
'redit	15 units
Prere/uisite(s#	1 . iology 245 (Aundamentals of Plant . iology# or its e/uivalent
. ? T 353	M ? \$ P (? " ? , @ ? A (, () \$ > ! S ' U " ! \$ P " ! 0 TS
! natomy and histology of higher vascular plants	
'redit	15 units
Prere/uisite(s#	1 . iology 245 (Aundamentals of Plant . iology# or its e/uivalent
. ? T 355	M ? \$ P (? " ? , @ ? A T (! " " ? P (@ T) S
! natomy and histology of thallophytes	
'redit	15 units
Prere/uisite(s#	1 . iology 245 (Aundamentals of Plant . iology# or its e/uivalent
. ? T 372	! * > ! 0 ') * P " ! 0 T P (@ S ? " ? , @
\$ecent developments in the field of photosynthesis% photorespiration% respiration% biosynthesis% hormones% transport and other physiological activities of plants	
'redit	15 units
Prere/uisite(s#	1 . iology 245 (Aundamentals of Plant . iology# or its e/uivalent
. ? T 373	P " ! 0 T ! 0 * E ! T) \$ \$) " ! T ? 0 S
Mechanisms of and factors affecting water utilization in plants	
'redits	15 units
Prere/uisite(s#	1 . iology 245 (Aundamentals of Plant . iology# or its e/uivalent
. ? T 383	P " ! 0 T , \$? E T (! 0 * *) >) " ? P M) 0 T
Patterns and regulation of plant growth and development	
'redit	15 units
Prere/uisite(s#	1 . iology 245 (Aundamentals of Plant . iology# or its e/uivalent
' () M 374	ST \$ U ' T U \$) ! 0 * AU 0 ' T ? 0 ? A . ? M ? ") ' U ") S
Structure and function of biochemical systems% their regulation% biosynthesis and coordinated metabolic pathways. \$ecent literature in molecular biology.	
'redits	15 units
' () M 373	" P * S % P \$? T) 0 S ! 0 * ' ! \$. ? (@ * \$! T) S
! dvances in lipid% protein and carbohydrate chemistry.)&traction and separation methods in lipid% protrein and c&arbohydrate analysis.	
'redit	15 units

Prere/uisite(s# 1 'hem 374

' ()M 375)OB@M)S

Enzyme structure and function! allosterism.)/uililibrium and :inetic aspects of enzymes reactions. 'oenzyme functions and structures. .iochemical mechanisms and their regulation.

'redit 15 units

Prere/uisite(s# 1 'hem 374

' ()M 377 0U' ") ?T *)S ! 0 * 0U' ") ' ! ' *

The replication of living organisms! mutations! repair mechanisms. \$ecent development in biochemistry of nucleotide and nucleic acids.

'redit 15 units

Prere/uisite(s# 1 chem. 374

' ()M 392)0> \$? 0M) 0T! " ' ()M ST\$@

*eals with the nature of air! land and water pollution! pollutants and their effects on the physical! chemical and biological processes and interrelationships between man and his environment! includes pollution monitoring! pollution control and abatement.

'redit 15 units

)OS' 342 P\$ 0' P")S ?A)0> \$? 0M) 0T! " S')0')

Materials and geologic processes and nature of the lithosphere! hydrosphere and atmosphere. .iosphere! principles and interactions associated with land! air and water environments and environmental health.

'redit 15 units (3 units lec! 2 unit lab#

)OS' 343)0> \$? 0M) 0T! " " ! ES ! 0 * P? " ')S

Environmental laws and policies in research and development in support of environmental management! planning and community advocacy. nstitutional framework: - organizations involved with environmental issues.

'redit 12 unit lecture

)OS' 345 \$)S?U\$ ') M! 0! ,)M) 0T ! 0 * ' ? 0S) \$> ! T ? 0

Natural resources focus on Philippine resources! issues and problems of natural resource management and conservation.

'redit 15 units lecture

)OS' 348)0> \$? 0M) 0T! " MP! ' T ! 0 * ! SS) SSM) 0T

Aramework: and methodology for environmental impact and assessment monitoring! prediction and assessment of impacts on the physical and biological environment! assessment of environmental resources in terms of physical of their potential for utilization and corresponding impact to human activities

'redit 17 units lec 3- lab

)OS' 334)0> \$? 0M) 0T! " ,) ? " ? , @

Geological materials and processes related to their influences on man's physical environment.)ffect of landscape modification and geological hazards such as earth/ua:es and landslides. Properties of minerals roc:s sediments and soils! and geological aspect of waste disposal and water resources. ?ccasional fieldtrips.

'redit 15 units

)OS' 338)")M) 0TS ?A ,) ? , \$! P (@

Models of earth! map reading! determination of locations! spatial distributions of coastal and marine resources! transportation and human settlements.

'redit 15 units

)OS' 354 M)T) ? \$? " ? , @ ! 0 * ' " M ! T ? " ? , @

lements of weather and climate! their measurements! ac/uissions! processing! and application of climatological data! classification of world and Philippine climates.

'redit 15 units (3 units lec! 2 unit lab#

)OS' 358)0> \$? 0M) 0T! ") * U' ! T ? 0

\$ationale of environmental education! and sustainable development! curriculum development! teaching strategies! designing pro-ects and then demonstrating them. \$eports! classroom e&perience! and other devices provide feddbac: on the implementation of the strategies.

'redit 15 units

Prere/uisite(s# 1)ducational Psychology and Methods of Teaching.

)OS' 374)0> \$? 0M) 0T! " P (@S ? " ? , @ ! 0 * T ? D ' ? " ? , @

Physical and chemical environment as it affects the physiology and population dynamics of organisms including humans. Stability and maintenance of biochemical cycles.

'redit 15 units

M. 323 Systematics of marine invertebrates, their relationship, life cycle, external and internal anatomy.
'redit 15 units (3 hrs. lec. 5 hrs. lab-w:#

M. 327 Biology of marine aquaculture, their importance in the economy of the sea with emphasis on their role in the food chain, sampling methodology, and preparation for biomass and productivity estimates.
'redit 15 units (3 hrs. lec. 5 hrs. lab-w:#

M. 326 Biology of fishes on classification, anatomy, life cycle, physiology and ecology, conservation and economic importance.
'redit 15 units (3 hrs. lec. 5 hrs. lab-w:#

M. 332 Composition and dynamics of marine ecosystems.
'redit 15 units
Prerequisite(s) 1. Bio 24 (General Biology)

M. 338 Structure and functions of marine ecosystems.
'redit 15 units (3 hrs. lec. 5 hrs. lab-w:#

M. 339 Principles of primary productivity with emphasis on photosynthesis, chemosynthesis, respiration, growth, biomass, chlorophyll, methods of measurement.
'redit 15 units (3 hrs. lec. 5 hrs. lab-w:#

M. 337 Types of marine pollutants, their sources, distribution and movement, measurements of the level of pollution and methods of control.
'redit 15 units (3 hrs. lec. 5 hrs. lab-w:#

M. 374 Venomous and toxic marine organisms, chemical analysis of toxins, their physiological effects, and pharmacologic importance.
'redit 15 units (3 hrs. lec. 5 hrs. lab-w:#

M. 372 Structure and function relationships of marine animals with emphasis on nutrition, respiration, osmoregulation, and excretion.
'redit 15 units (3 hrs. lec. 5 hrs. lab-w:#

M. 372 Structure and function relationships of marine plants with emphasis on nutrition, respiration, osmoregulation, and excretion.
'redit 15 units (3 hrs. lec. 5 hrs. lab-w:#

M. 338 Principles of marine resource conservation, rational utilization, protection and management of the marine environment, conservation laws.
'redit 15 units (3 hrs. lec. 5 hrs. lab-w:# field observations, eff, @10s. le-as ld obser "s.f0miof,!.f0m.fy? \$Piples o

M . 3;9 M!\$ 0) M)T(?*?"? ,@
Methods and techni/ues in marine biological research or in oceanographic wor:.
'redit 15 units (5 hrs.lec-w:#

M . 544 M!ST)\$!" T()S S
! research study or pro-ect to be conducted by masteral student.
'redit 18 units

M' . 342 0*UST\$!" M '\$?. ?"?, @
Thorough discussions on the industrial applications of microorganisms. Ma-or classes of products and processes and microorganisms used in industrial processes will be discussed.
'redit 15 units
Prere/uisite(s# 1 . io 23< (, en. Microbiology# or its e/uivalent

M' . 345 M!\$ 0) M '\$?. ?"?, @
Marine microorganisms with emphasis on their role in the degradation and recycling of nutrients in the marine ecosystem. *iscussions on the biotechnological applications of some important forms will be included.
'redit 15 units

M' . 34= A??* M '\$?. ?"?, @
*iscusses the normal flora of foods, their significance, and the manner in which foods may be protected from microbial contamination and microbial spoilage. Aood products manufactured by microbial fermentation, the role of foods in the transbmission of the diseases and food poisoning will be discussed.
'redit 15 units
Prere/uisite(s# 1 . io 23< (, en. Microbiology# or its e/uivalent

M' . 348 *)T)\$M 0!T >) ! 'T)\$?"?, @
Thorough discussions on the criteria for classification and identification of bacteria. Specific groups of bacteria will be isolated and identified.
'redit 15 units
Prere/uisite(s# 15 units< (, en. Microbiology# or its e/uivalent

M' . 34< M '\$?. !" T?D OS

Prere/uisite(s# 1 . io 23< (, en. Microbiology# or its e/uivalent

MPS \$??, @!" T! S P?""? , @
M' . 349 M '\$?. !" T)' (U*
15 units< (, en. Microbiology# or its e/uivalent

Discussions on the factors which influence the growth of microorganisms.

Discussions on standard techniques used in industrial microbiology. Control of safety

Principles of heredity in microbial systems and their application in microbiology and molecular biology.

Credit 15 units

Prerequisite(s) BIO 231 (, en. Microbiology# and BIO 248 (, en. Genetics# or its equivalent

BIOL 342 AU0 * !M) 0T! "S ?A P (@S ' ! " % ' () M ' ! " % ! 0 * . ? " ? , ' ! "

BIOL 342, \$!P(@

Physical dynamics and chemical processes of the cell

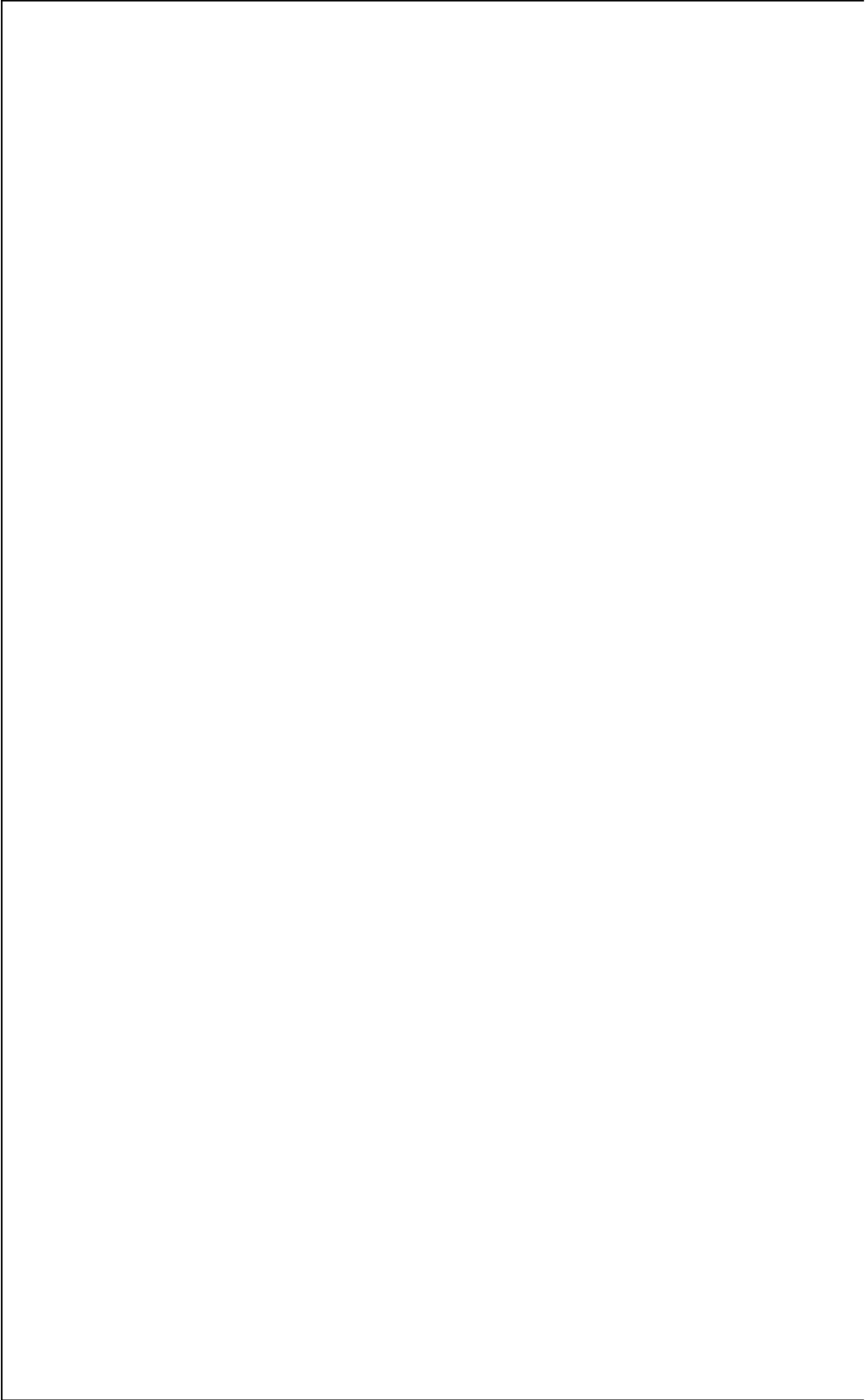


BACHELOR OF SCIENCE

		First Semester			Second Semester			Total		
		*	24	5	*	24	5			
1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33
34	35	36	37	38	39	40	41	42	43	44
45	46	47	48	49	50	51	52	53	54	55
56	57	58	59	60	61	62	63	64	65	66
67	68	69	70	71	72	73	74	75	76	77
78	79	80	81	82	83	84	85	86	87	88
89	90	91	92	93	94	95	96	97	98	99
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111	112	113	114	115	116	117	118	119	120	121
122	123	124	125	126	127	128	129	130	131	132
133	134	135	136	137	138	139	140	141	142	143
144	145	146	147	148	149	150	151	152	153	154
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188	189	190	191	192	193	194	195	196	197	198
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221	222	223	224	225	226	227	228	229	230	231
232	233	234	235	236	237	238	239	240	241	242
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254	255	256	257	258	259	260	261	262	263	264
265	266	267	268	269	270	271	272	273	274	275
276	277	278	279	280	281	282	283	284	285	286
287	288	289	290	291	292	293	294	295	296	297
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353	354	355	356	357	358	359	360	361	362	363
364	365	366	367	368	369	370	371	372	373	374
375	376	377	378	379	380	381	382	383	384	385
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441	442	443	444	445	446	447	448	449	450	451
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474	475	476	477	478	479	480	481	482	483	484
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518	519	520	521	522	523	524	525	526	527	528
529	530	531	532	533	534	535	536	537	538	539
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562	563	564	565	566	567	568	569	570	571	572
573	574	575	576	577	578	579	580	581	582	583
584	585	586	587	588	589	590	591	592	593	594
595	596	597	598	599	600	601	602	603	604	605
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617	618	619	620	621	622	623	624	625	626	627
628	629	630	631	632	633	634	635	636	637	638
639	640	641	642	643	644	645	646	647	648	649
650	651	652	653	654	655	656	657	658	659	660
661	662	663	664	665	666	667	668	669	670	671
672	673	674	675	676	677	678	679	680	681	682
683	684	685	686	687	688	689	690	691	692	693
694	695	696	697	698	699	700	701	702	703	704
705	706	707	708	709	710	711	712	713	714	715
716	717	718	719	720	721	722	723	724	725	726
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749	750	751	752	753	754	755	756	757	758	759
760	761	762	763	764	765	766	767	768	769	770
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793	794	795	796	797	798	799	800	801	802	803
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815	816	817	818	819	820	821	822	823	824	825
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848	849	850	851	852	853	854	855	856	857	858
859	860	861	862	863	864	865	866	867	868	869
870	871	872	873	874	875	876	877	878	879	880
881	882	883	884	885	886	887	888	889	890	891
892	893	894	895	896	897	898	899	900	901	902
903	904	905	906	907	908	909	910	911	912	913
914	915	916	917	918	919	920	921	922	923	924
925	926	927	928	929	930	931	932	933	934	935
936	937	938	939	940	941	942	943	944	945	946
947	948	949	950	951	952	953	954	955	956	957
958	959	960	961	962	963	964	965	966	967	968
969	970	971	972	973	974	975	976	977	978	979
980	981	982	983	984	985	986	987	988	989	990
991	992	993	994	995	996	997	998	999	1000	1001
1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012
1013	1014	1015	1016	1017	1018	1019	1020	1021	1022	1023
1024	1025	1026	1027	1028	1029	1030	1031	1032	1033	1034
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1057	1058	1059	1060	1061	1062	1063	1064	1065	1066	1067
1068	1069	1070	1071	1072	1073	1074	1075	1076	1077	1078
1079	1080	1081	1082	1083	1084	1085	1086	1087	1088	1089
1090	1091	1092	1093	1094	1095	1096	1097	1098	1099	1100
1101	1102	1103	1104	1105	1106	1107	1108	1109	1110	1111
1112	1113	1114	1115	1116	1117	1118	1119	1120	1121	1122
1123	1124	1125	1126	1127	1128	1129	1130	1131	1132	1133
1134	1135	1136	1137	1138	1139	1140	1141	1142	1143	1144
1145	1146	1147	1148	1149	1150	1151	1152	1153	1154	1155
1156	1157	1158	1159	1160	1161	1162	1163	1164	1165	1166
1167	1168	1169	1170	1171	1172	1173	1174	1175	1176	1177
1178	1179	1180	1181	1182	1183	1184	1185	1186	1187	1188
1189	1190	1191	1192	1193	1194	1195	1196	1197	1198	1199
1200	1201	1202	1203	1204	1205	1206	1207	1208	1209	1210
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1222	1223	1224	1225	1226	1227	1228	1229	1230	1231	1232
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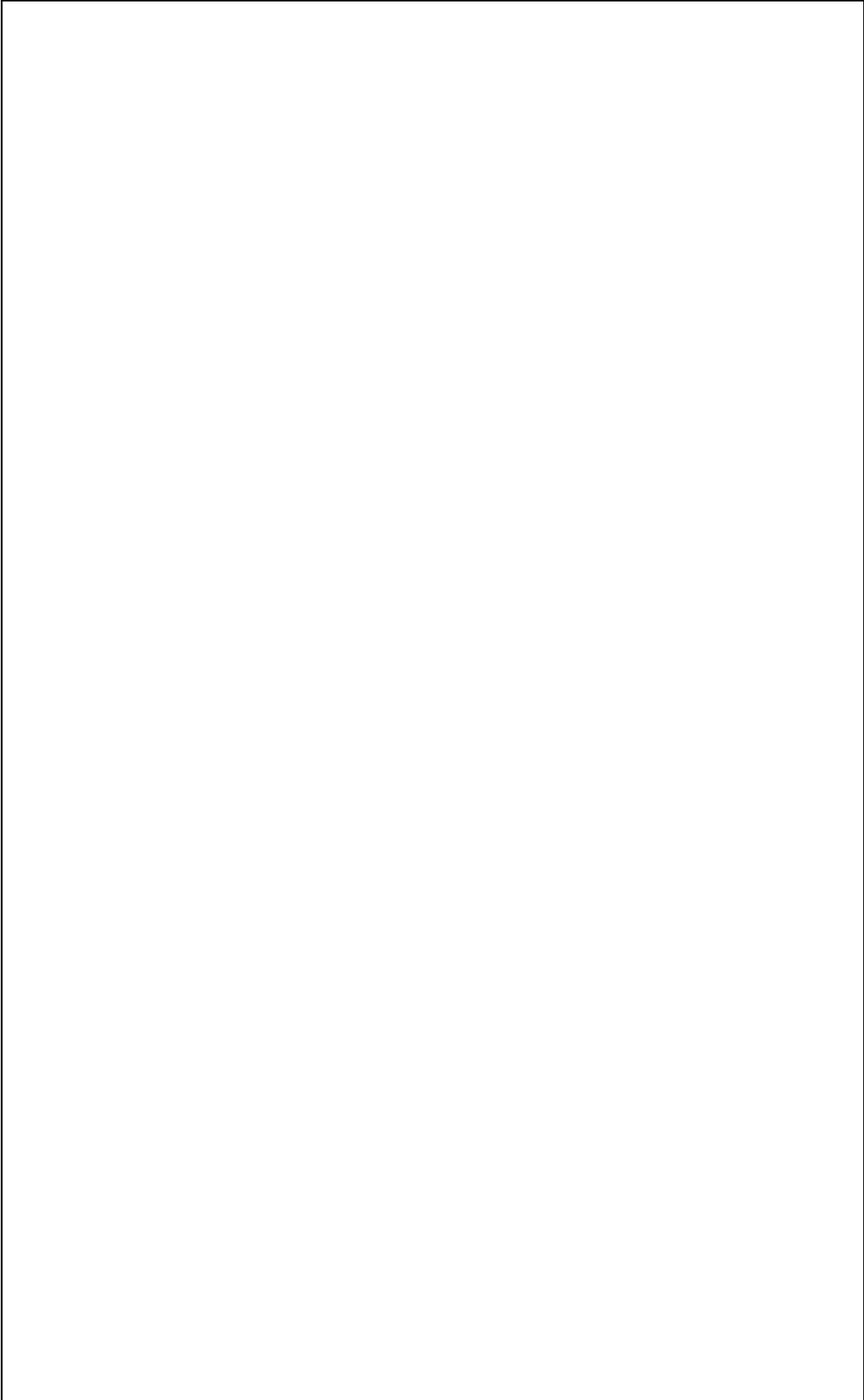
. S . ? " ? , @ ' ? U \$ \$) S

. io 2	asic . iology
*eals with the fundamental concepts of biology sciences leading to their full understanding especially as they relate to humans. This may include demonstrations of laboratory s:ills and other teaching strategies.	
' redit	1 5 units (3 h lec% 5 ("ab#
. io 242	ntroduction to . iological Science
(istory of biology as a science% unifying concepts in biology% cellular basis of life. ?ngoing flow of life% evolutionary concepts and ecology.	
' redit	1 3 units (3 h lec#
Prere/uisite	1 none
. io 242.2	ntroduction to . iological Sciences "aboratory
"aboratory component of . iology 242.2	
' redit	1 2 unit (5 h lab#
. io 243	Aundamentals of !nimal . iology
!nimal system and their control- information flow and the neuron% nervous systems% integration and control% sensory systems% motor systems% circulation% immunity% respiration% digestion and organic metabolism% temperature control and fluid regulation% reproduction and development.	
' redit	1 3 units (8 h lab#
. io 245	Aundamentals of Plant . iology
?verview of the plant body% plant functioning% reproduction and embryonic development% growth and development.	
' redit	1 3 units (3 h lec#
Prere/uisite	1 . io 242
. io 247	. iodiversity
' oncepts and principles in biodiversity. The course integrates basic biological concepts pertaining to biodiversity of genetic% species and ecosystems levels and their socio-economic relevance. Theoretical and e&perimental approaches in the understanding of biodiversity will be given a ma-or attention.	
' redit	1 3 units (3 h lec#
Prere/uisite	1 . io 243% . io 245
. io 245.3	Aundamentals of Plant . iology "ab
"aboratory component of . iology 245.	
' redit	1 3 units (8 h lab#
. io 247.2	. iodiversity "aboratory
"aboratory component of . iology 247.	
' redit	1 2 unit (5 h lab#
. io 24=	Systematics
Scientific study of the :inds and diversity of organisms (populations% species and higher ta#a# and the relationships among them% determination by means of comparison of what the uni/ue properties of each species and higher ta#a are properties certain ta&on have in common and biological causes of the difference or shared characteristics% study of variation within ta&a.	
' redit	1 3 units (3 h lec#
Prere/uisite	1 . io 243% . io 245
. io 24=.3	Systematics "aboratory
"aboratory component of . iology 24=.	
' redit	1 3 units (8 h lab#
. io 248	, eneral , enetics
, eneral principles of the patterns of inheritance% variations of Mendel's themes% chromosomal theory% lin: age% /uantitative traits% molecular basis of inheritance% recombinant * 0 ! and genetic engineering.	
' redit	1 3 units (3 h lec#

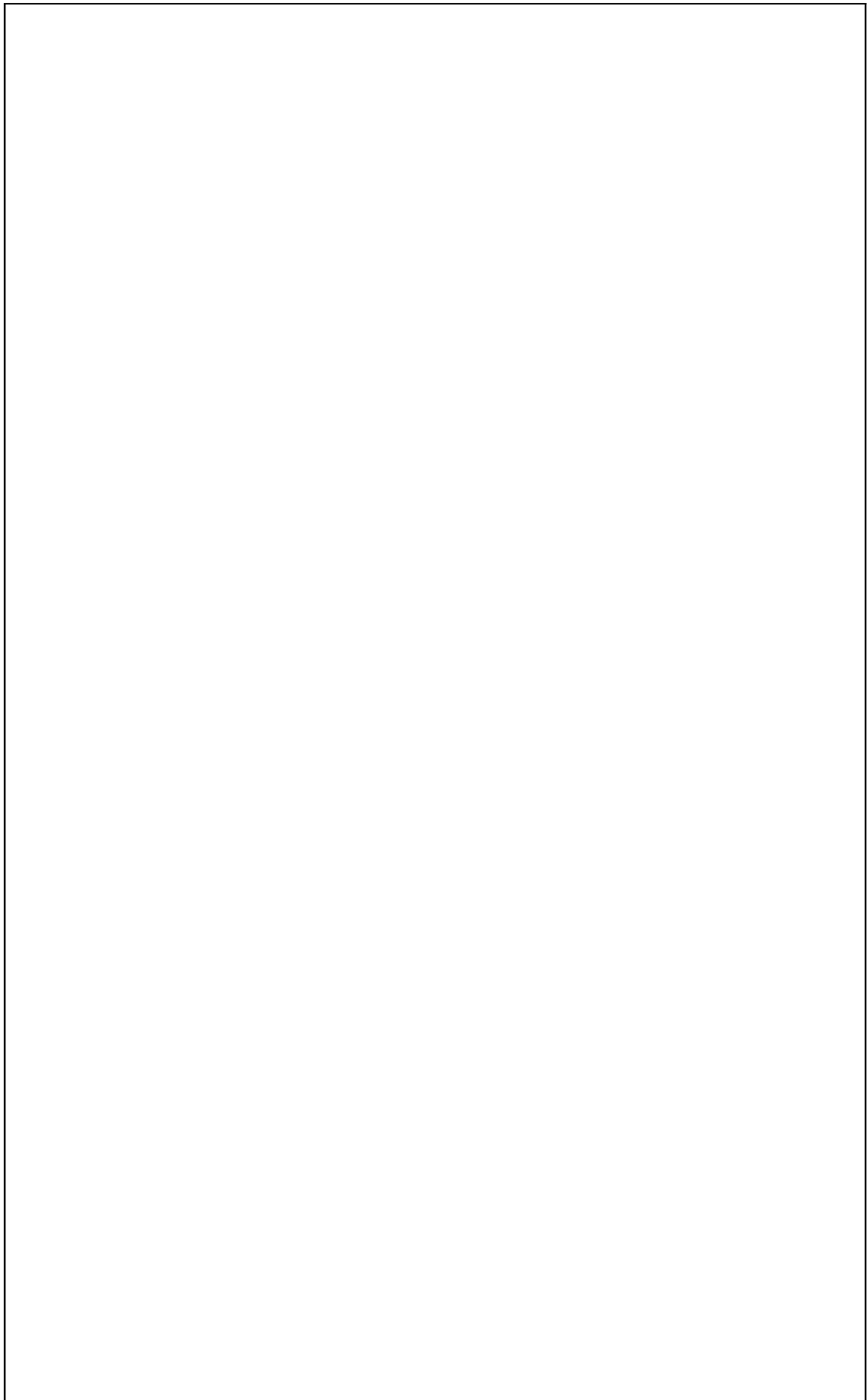


"aboratory component of . iology 229. ' redit	1 2 unit (5 h lab#
. io 22; * iscussion on current trends% concepts in genetics at the molecular% cellular and population level. ' redit	! dvanced , enetics 1 5 units (5 h lec#
Prere/uisite	1 . io 248
. io 234 Morphogenesis and cytodifferentiation in plants% ontogenetic and phylogenetic development in animals. ' redit	* evelopmental . iology 1 3 units (3 h lec#
Prere/uisite	1 . io 243% . io 245
. io 232 Scientific study of natural resistance to pathogens and of the immune systems% immunogenicity and antigenic specificity% structure and functions of immunoglobulins% ' omplement system% autoimmunity% mimmunity and infection% tumor immunology% immnuomodualtion. ' redit	mmunology 1 3 units (3 h lec#
. io 232.2 "aboratory component of . iology 232. ' redit	mmunology " ab 1 2 unit (5 h lab#
. io 233 Methods and the techni/ues of the collection% processing% staining and preservation of unicellular organisms% tissues and fragments from living organisms. ' redit	Microtechni/ue 1 3 units (3 h lec#
Prere/uisite	1 . io 243% . io 245
. io 233.2 "aboratory component of . iology 233. ' redit	Microtechni/ue " ab 1 2 unit (5 h lab#
. io 235 Study on the principles and techni/ues of recombinant * 0 ! technology and their applications in industry% agriculture% medicine and allied fields. ' redit	\$ecombination * 0 ! Techni/ues 1 3 units (3 h lec#
Prere/uisite	1 . io 249
. io 235.2 "aboratory component of . iology 235 ' redit	\$ecombination * 0 ! Techni/ues "aboratory 1 2 unit (5 h lab#
. io 237 Study on the structure and function of ma+or algal groups% diversity and systematics of unicellular and multicellular algae found in a/uatic and terrestrial habitats. Philippoine specimens will be the ma+or materials for the study. ' redit	Phycology 1 3 units (3 h lec#
Prere/uisite	1 . io 245
. io 237.2 "aboratory component of . iology 237 ' redit	Phycology " ab 1 2 unit (5 h lab#
. io 23= Study on the structure and function of ma+or groups of fungi% ta&onomy% ecology and evolution of ma+or ta&a.)mphasis will be on Philippine specimens. ' redit	Mycology 1 3 units (3 h lec#
. io 23=.2	Mycology " ab

"aboratory component of . iology 23=	
'redit	1 2 unit (5 h lab#
. io 238	\$adiation . iology
nteraction of radiation with biological matter; ionizing radiation; radioactivity; radiation detection and dositometry; uses in biology; effects on molecules; cellular radiation biology; effects on organs systems; effects on humans; and radiation protection.	
'redit	1 5 units (5 h lec#
Prere/uisite	1 . io 243; . io 245
. io 23<	, eneral . iology
ntroduction to the concepts of the structure and function in microorganisms; laboratory techni/ues in the study of microorgsnisms.	
'redit	1 3 units (3 h lec#
Prere/uisite	1 . io 243; . io 245
. io 23<.3	, eneral . iology "ab
"aboratory component of . iology 23<	
'redit	1 3 units (8 h lab#
. io 239	, eneral >irology
'haracteristics of viruses; including structure; chemical composition and reproduction. ncluded also are epidemiology and methods of detection.	
'redit	1 3 units (3 h lec#
Prere/uisite	1 . io 23<
. io 239.2	, eneral >irology "ab
"aboratory component of . iology 239	
'redit	1 2 unit (5 h lab#
. io 23;	Microbial Ta&onomy
Ta&onomic relationships among groups in the microbial world; discussions on the various classification systems and the criteria for identification and classification.	
'redit	1 3 units (3 h lec#
Prere/uisite	1 . io 23<
. io 23;.2	Microbial Ta&onomy "ab
"aboratory component of . iology 23;	
'redit	1 2 units (2 h lab#
. io 254	Microbial Physiology
)nergy-yielding and energy-re/uiring processes in microorganisms and microbial nutrition. ncluded are discussions on growth; differentiation and transport systems in microorganisms.	
'redit	1 3 units (3 h lec#
Prere/uisite	1 . io 24;
. io 254.2	Microbial Physiology "ab
"aboratory component of . iology 254	
'redit	1 2 unit (5 h lab#
. io 252	Microbial)ecology
Scientific investigation on the natural occurrence of microbes in the environment and the interrelationship of microorganisms and other organisms li : e man; other animal and plants.	
'redit	1 3 units (3 h lec#
Prere/uisite	1 . io 23<
. io 252.2	Microbial)ecology "ab
"aboratory component of . iology 252	
'redit	1 2 unit (5 h lab#



. io 259	. ehavioral)cology
. ehavioral patterns at the individual and population levels and their implications at the community and ecosystem levels. Special focus will be given to sociality% reproductive% integrative% defensive and optimal foraging behaviors.	
' redit	1 3 units (3 h lec#
Prere/uisite	1 . io 24<
. io 259.2	. ehavioral)cology "ab
"aboratory component of . iology 259	
' redit	1 2 unit (5 h lab#
. io 25;	' ommunity)cology
' oncepts related at the individual and population levels and their implications at the community and the ecosystem levels. Special focus will be given to sociality% reproductive% integrative% defense and optimal foraging behaviors.	
' redit	1 3 units (3 h lec#
Prere/uisite	1 . io 24<
. io 25;.2	' ommunity)cology "ab
"aboratory component of . iology 25;	
' redit	1 2 unit (5 h lab#
. io 274	ntroduction to)nvironmental Science
(olistic understanding on the role of man in his environment. The course will include the evolution of man and diversity and magnitude of modifications impacted by man in the environment.)nvironmental impact assessment will be prime practical activity.	
' redit	1 3 units (3 h lec#
Prere/uisite	1 . io 243% . io 245
. io 274	ntroduction to)nvironmental Science "ab
"aboratory component of . iology 274	
' redit	1 2 unit (5 h lab#
. io 272	Philippine E ildlife
Species composition% distribution and abundance of plants and animals endedmic and introduced to the Philippine habitats. Parameters that determine the variability and the pattern in the distribution and the abundance of Philippine E ildlife will be given focus.	
' redit	1 3 units (3 h lec#
Prere/uisite	1 . io 247% . io 24=
. io 272.2	Philippine E ildlife "ab
"aboratory component of . iology 272	
' redit	1 2 unit (5 h lab#
. io 273)cosystem)cology
' oncepts related with spatial and temporal variations of assemblages of communities and-or ecosystems. . iological% physical and chemical factors that affect these emerge will be given attention.	
' redit	1 3 units (3 h lec#
Prere/uisite	1 . io 24<
. io 273.2)cosystem)cology "ab
"aboratory component of . iology 273	
' redit	1 2 unit (5 h lab#
. io 275	. iological \$esource Management
! general course on concepts related with the sustainable use of biological resources. !pproaches in resource management including assessment% Multiple and integrated use% conflict resolution% nature par:s and reservices% resource evaluation !nd e/uitability and gender roles will be covered.	
' redit	1 3 units (3 h lec#
Prere/uisite	1 . io 243% . io 245



. io 27; nsect *evelopment
. iology and development of the various groups of insects. This considers the different in the body and
behavior of the different stages of the individual insect.
'redit 1 3 units (3 h lec#
Prere/uisite 1 . io 243

. io 27;.2 nsect *evelopment "ab

"aboratory component of . iology 2=7
'redit 1 2 unit (5 h lab#

. io 2== nsect Pathology
Taxonomy and general biology of microorganisms pathogenic to insects culture-propagation of
microorganisms of control.
'redit 1 3 units (3 h lec#
Prere/uisite 1 . io 243

. io 2==.2 nsect Pathology "ab
"aboratory component of . iology 2==
'redit 1 2 unit (5 h lab#

. io 2=8 nvertebry c ' ' ' A ec#

*iversity and systematics of fishes. !spects on evolution% physiology% ecology and behavior will be included.	
'redit	1 3 units (3 h lec#
Prere/uisite	1 . io 243
. io 282.2	chthyology "ab
"aboratory component of . iology 284	
'redit	1 2 unit (5 h lab#
. io 283	E ildlife)cology
nteraction of wildlife organisms and their environment! population% community and ecosystem level of discussion.	
'redit	1 3 units (3 h lec#
Prere/uisite	1 . io 243% . io 245
. io 283.2	E ildlife)cology "ab
"aboratory component of . iology 283	
'redit	1 2 unit (5 h lab#
. io 285	Mosses% (epatics and Aerns
*iversity and systematics of mosses% hepatics and ferns found in a/uatic and terrestrial habitats. Philippine specimens will be the ma+or materials for the study.	
'redit	1 3 units (3 h lec#
Prere/uisite	1 . io 245
. io 285.2	Mosses% (epatics and Aerns "ab
"aboratory component of . iology 285	
'redit	1 2 unit (5 h lab#
. io 287	, ymnosperms and !ngiosperms
*iversity and systematics of seed-bearing plants in a/uatic and terrestrial habitats. Philippine specimens will be the ma+or materials for the study.	
'redit	1 3 units (3 h lec#
Prere/uisite	1 . io 245
. io 287.2	, ymnosperms and !ngiosperms "aboratory
"aboratory component of . iology 287	
'redit	1 2 unit (5 h lab#
. io 28=	>ertebrate Boology
. iology of Philippine >ertebrates% ta&onomy and systematics% distribution and status% and method of conservation.	
'redit	1 3 units (3 h lec#
Prere/uisite	1 . io 243
. io 28=.2	>ertebrate Boology "ab
"aboratory component of . iology 28=	
'redit	1 2 unit (5 h lab#
. io 288	Marine Plants
Ta&onomy and systematics% physiology% life history and ecology of marine plants.	
'redit	1 3 units (3 h lec#
Prere/uisite	1 . io 245
. io 288.2	Marine Plants "ab
"aboratory component of . iology 288	
'redit	1 2 unit (5 h lab#
. io 28<	Marine >ertebrates
Systematics% ecology% ethology% physiology and morphology of marine vertebrates.	

'redit	1 3 units (3 h lec#
Prere/uisite	1 . io 243
. io 28<.2	Marine >ertebrates "ab
"aboratory component of . iology 28<	
'redit	1 2 unit (5 h lab#
. io 289	Marine nvertebrates
Systematics% ecology% ethology% physiology and morphology of marine vertebrates.	
'redit	1 3 units (3 h lec#
Prere/uisite	1 . io 243
. io 289.2	Marine nvertebrates "ab
"aboratory component of . iology 289	
'redit	1 2 unit (5 h lab#
. io 28;	Marine nvertebrates "ab
. iology of marine plan:ton% their imporatanace in the economy of the sea with emphasis on their role in the food chain% sampling methods and preparation for biomass and productivity estimates.	
. io 28;.2	Marine nvertebrates "ab

? cea 242	? ceanology
Study of the geological, physical, biological and chemical processes in the ocean. The course also includes meteorology.	
' redit	1 3 units (3 h lec#
? cea 242.2	? ceanology "ab
"aboratory component of ? cea 242.	
' redit	1 2 unit (5 h lab#