BIOLOGY STUDENT HANDBOOK

2017-2018

Millersville University

Find this handbook electronically on the Biology homepage (www.millersville.edu/biology/) under "Quick Links".

Welcome!

Welcome to the community of biologists at Millersville University. We are delighted that you have chosen to study life science, and we share with you the conviction that the study of life processes is an exciting intellectual adventure. Making prudent use of all the opportunities which exist here for you is no simple task. Because you will reap the rewards of a superb education in life science, you have full responsibility for decisions pertaining to curricular and extracurricular matters. In order to help you we have prepared this *Biology Student Handbook*. We hope that you will find this handbook useful throughout your career at Millersville.

The Department of Biology is as diverse as life itself. Approximately 19 fulltime faculty do biology in laboratory and field environments. We encourage students to do science in the context of laboratory exercises, class projects, independent studies, honors theses, and research internships. Often results of these projects are presented at scientific seminars and professional meetings; some are published as articles in scientific journals. Through this interaction with faculty and others, our students do well when they seek further study or employment.

We are extremely proud of our students and our graduates. Many of our graduates are very successful biologists in a wide variety of endeavors including medicine, allied health, industry, and academia. Success in any area involves reaching one's potential. In a variety of ways, we provide opportunities for you to reach your full potential, but you must realize that personal growth and learning are your responsibilities. We hope that you will use our faculty and facilities to the fullest. We challenge you to learn and grow. If you leave Millersville University with an excitement for the study of life and a mastery of the major concepts of biology, and if you know how to define problems and to search for solutions to these problems, we all have succeeded.

Departmental Goal

The primary goal of the Department of Biology is to provide students with extensive, contemporary knowledge of life science in the context of a rigorous liberal arts education. The variety of our programs addresses the diverse biological careers found in our world of change. Creative teaching, an open collegial environment, and diverse forums such as colloquia, independent study, field trips, and student clubs help us achieve this goal.

We strongly believe that every student of biology (professors and undergraduates!) must be a creative scholar who actively participates in the acquisition and communication of knowledge. We encourage students to participate in a variety of scholarly activities so that they better appreciate the substance and challenge of biology.

A Brief History of The Department of Biology

The department of biology has a long history of academic excellence beginning with the founding of the Millersville Academy in 1854. Shortly thereafter, in December of 1859, the academy was transformed into Pennsylvania's first normal school. In 1928, Millersville Normal School became a state teacher's college and was empowered to grant the B.S. degree in education. Millersville State Teachers College became Millersville State College in 1959; this transformation was associated with an expansion of the liberal arts programs. Since July of 1983, we have been Millersville University of Pennsylvania.

The Millersville institutions, whatever their names, were fortunate to have gifted and dedicated professors to guide the development of science programs over these formative years. The most renowned of these individuals was Dr. H. Justin Roddy, an internationally known naturalist for whom our science building is named. In 1949, the college was organized into departments and Dr. Arthur H. Gerhart, a botanist, became the first chair of the Science Department. By 1958, a biology section was formed within the Science Department. Dr. Alex Henderson was appointed coordinator of this section with a staff of six biologists. In 1967, the large Science Department was separated into four individual departments and Dr. Henderson became biology's first chairperson.

In recent years, the department and its offerings have grown tremendously. We offer bachelor's programs in traditional, liberal arts biology as well as options in teacher education, marine biology, botany, ecology, molecular biology, medical technology, nuclear medicine technology and respiratory therapy. In addition, we provide pre-professional concentrations in podiatry, optometry, medicine, dentistry and veterinary medicine. A few students are also enrolled in a master's degree program.

Today, the department consists of 19 fulltime faculty members, several adjunct faculty members, a lab manager, one fulltime and one part-time secretary, and approximately 700 students who have chosen biology as their undergraduate major.

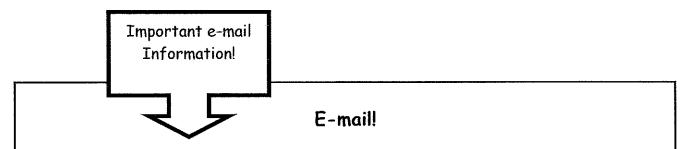
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	BS ALHT Sports Medicine	
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	BS BIOL	
	BSE BIOL	
	BS BIOL Animal Behavior	
	BS BIOL Botany	
	BS BIOL Environmental Biology	
	BS BIOL Marine Biology	
	BS BIOL Medical Technology	
	BS BIOL Molecular Biology/Biotechnology	
	BS BIOL Nuclear Medicine	
	BS BIOL Pre-Optometry	
	BS BIOL Pre-Podiatry	
	BS BIOL Respiratory Therapy	

Sources of Information

Many sources of information can help you understand the workings of Millersville University. Be prudent; use several sources of information when confronted with a problem. Guidelines to help you comprehend University policy are published in a number of references and our staff can help you to interpret this material.



Note that the Biology Department requires that all Biology majors and minors use a campus e-mail address. We use e-mail to improve communication between students, the professors of their courses, and their academic advisors concerning a variety of issues, including course assignments and examinations, advising, etc. We regularly post e-mails about changes in course schedules, reminders about deadlines, job and co-op opportunities, etc. We urge you to check your campus e-mail regularly so that you do not miss important information!

Campus e-mail is free and easy to obtain. Visit the Help Desk in Boyer or the MU web page for instructions! The Biology Department also posts important announcements on our web page. You should check that page regularly!

Published Material

- ✓ Millersville University Undergraduate Catalog. General descriptions of academic policies and programs are described in this volume. Be sure to keep a copy of the catalog associated with the year you entered the University. This volume represents your agreement with the University. http://www.millersville.edu/catalogs/undergraduate/index.pdf
- ✓ Biology Student Handbook. Opportunities for students majoring in biology are described in this manuscript. Be sure to keep this handbook while you are a biology major, since it contains curriculum record forms for the different programs in biology. You must satisfy the requirements as stated on these forms if you remain enrolled as a biology major on a continuous basis; subsequent changes in the curricula will not apply to you. Find the handbook on the Biology homepage (www.millersville.edu/biology/) under "Quick Links".
- ✓ Millersville University Student Handbook. This booklet contains descriptions of policies on social and academic issues pertaining to students. In addition, narratives depicting student organizations will help you find extracurricular activities of interest.
 http://www.millersville.edu/judicialaffairs/files/StudentCodeofConduct.pdf

- ✓ Millersville University Directory. This online directory contains much more information than just telephone numbers; a large directory of services and offices are listed according to the specific help one may desire. http://www.millersville.edu/directory/index.php
- ✓ Millersville University Governance Manual. Your faculty advisor has a copy of this weighty tome; it describes University policies in detail. It is also available online.

Human Resources

•	 Faculty Advisor. Your faculty advisor is an excellent source of information. Not only is y familiar with your academic records, she/he has knowledge of the requirements for your major. Moreover, your advisor knows what the post-MU world expects of you. 	
	Faculty Advisor: Name Phone Number:	
•	• Department Chair: Dr. John F. Hoover (Caputo 312, x7427), Chairperson of Biology, is w	llina and

- Department Chair: Dr. John E. Hoover (Caputo 312, x7427), Chairperson of Biology, is willing and
 ready to talk to any student with a problem. Suggestions on how we might improve the academic
 environment at MU are encouraged and welcome. E-mail: john.hoover@millersville.edu
- Lab Manager: Mr. Cyril Foray (Roddy 278, x4319), Lab Manager, maintains our greenhouse, animal
 care facility, WebPages, general biology labs, and cell biology labs. If you have any inquiries about
 any of these areas, please call Mr. Foray. E-mail: cforay@millersville.edu
- Department Secretary. Mrs. Beth Roberts (Roddy 288, 871-4321) is the fulltime secretary for the
 department. She welcomes your questions and can provide you with miscellaneous information,
 various forms, etc. E-mail: beth.roberts@millersville.edu.
- Allied Health Coordinator. Dr. Judith Cebra-Thomas (Roddy 281, x7441) is the person to talk with if
 you have an interest in one of the allied health programs or medical school. E-mail: <u>judith.cebra-thomas@millersville.edu</u>.
- Respiratory Therapy Program Director. Students who desire information about the respiratory therapy program should make an appointment to talk with Ms. Elaine Chrissos (717-291-8457). E-mail: elaine.chrissos@millersville.edu
- Office of Academic Advisement. The office of academic advisement is located in Lyle Hall (x5333).
 They can help clarify General Education requirements.
 http://www.millersville.edu/~advisement/?page=degreg
- Career Services. The Career Services staff (Bedford House, x7655) is always willing to help students find information on career opportunities. http://www.millersville.edu/elcm/careerservices/
- Registrar's Office (Lyle Hall, x5005). The registrar's office maintains the academic records of students. Contact this office with questions about your record. http://www.millersville.edu/registrar/

- Counseling and Human Development Center. (Lyle Hall, x7821). Should you have problems with learning skills, emotional difficulties, or adjusting to life at MU, use the services this center offers. http://www.millersville.edu/counsel/
- Tutoring. MU has free tutoring for students having difficulty with a particular subject. If you need help with biology, or would like to help others by being their tutor, contact the Tutoring Center, (Lyle Hall, 871-7222 or tutoringcenter@millersville.edu). Tutor request forms are available from that office. http://www.millersville.edu/tutoringcenter/apply-to-get-a-tutor.php
- Center for Student Involvement & Leadership Office (SMC, x7057). Information concerning student organizations and activities can be obtained through this office. http://www.millersville.edu/csil/index.php
- Health Services. MU Health Services (Witmer, x5250). Use the infirmary if you are ill (non-emergency medical call x5250). <u>In case of serious injury or assault dial 911</u>.
- University Police. Lebanon House, 237 N. George Street, x4357. The University Police are always ready to help students in need. http://www.millersville.edu/police/

Your Academic Advisor and You

Each entering student is assigned a faculty advisor based upon the stated interests of the student. We try to match the interests of the student with the expertise of the faculty member. Should you discover that your interests have changed, you may change advisors. Simply contact the department chairperson. The function of the academic advisor is to guide the student in course and program selection, assist with academic difficulties, and provide counsel on careers and other goals.

Students, who develop a good working relationship with their faculty advisor early in their careers, receive the most help and meet the academic requirements of a program with fewest complications. Moreover, they are more likely to develop and successfully pursue career goals. Should you have difficulty developing a satisfactory relationship with your faculty advisor, feel free to change advisors. A well-cultivated relationship with your advisor should be a source of an excellent letter of recommendation for graduate or professional schools and job applications.

<u>students are required to meet with their advisor during the registration period</u>
<u>each semester</u> for the purposes of counsel and guidance in course selection; in
addition, your advisor will help you with the paperwork associated with registration.
The faculty advisor, the instructors of the courses, the administrators, the University
staff, and other students all play a role in student development. However, the
greatest responsibility falls to the individual student for her/his own destiny. One of
the important duties of the advisor is to assist the student in assuming this
responsibility. Listed on the next page are a number of specific actions which advisees
should take to enhance the advisement process.



- ✓ Give thoughtful consideration to your personal goals. Many new students have spent little time thinking about their future. That you have made final decisions about your future is of little concern; however, we urge you to begin an active sorting of your personal goals so that your education at MU can be the most meaningful possible. How can you make academic and professional plans without a direction? How can we help you plan your study?
- ✓ Discuss your long-range goals with your advisor. Unless you give your advisor some idea of what you really want to be doing four or five years from now, he/she will not be able to suggest what courses and activities would be most helpful for you. Just talking with your advisor about career possibilities in your area can help you to crystallize your thoughts. Remember, though, that no one can guarantee you will be employed when you finish your degree. You might want to include in your long-range goals ways of gaining ancillary skills that will make you more attractive to employers.
- ✓ Know the basic requirements of your chosen major. Once you have decided on a major and an option within that major, know the requirements. Be able to ask meaningful questions about requirements, options, electives, etc. Obtain a copy of the curriculum record form from your advisor, the Biology Office or the Registrar's Office.
- Make a plan to map out your entire program of study for a degree. Once you have identified a major and the option you desire, take a few moments to plan your study to completion. You should be able to identify when you will have to take required courses and at what point the prerequisites for these courses will have to be taken. Certainly, such a plan will tell you if it is possible to complete a program of study within a given time period.
- ✓ Accept responsibility for making final decisions on academic matters. Your advisor will tell you about the courses you "must take" and show you possible alternatives for electives. You must choose among these alternatives. Obviously, to make the best choices, you must know yourself and the direction in which you are headed.
- ✓ Become familiar with the University Catalog and the Class Schedules. Enroll in the courses you are required to take first. Not all courses are available every semester; in addition, conflicts could arise in the future which would delay your graduation.
- ✓ Keep your advisor informed of changes in your schedule. Your advisor is a great source of help, especially when you encounter problems. Keeping your advisor apprised of situations which bear upon your academic program makes it more likely that you will receive better advising.
- ✓ Maintain copies of your academic records. Keep a file of your academic records. Include the University Catalog, the Biology Student Handbook, the curriculum record forms for general education and major requirements, grade slips, approval forms, information denoting transfer of credit, and your degree audit report from DegreeWorks.

Admission to the Biology or Allied Health Technology Majors

- 1. New students (freshmen and transfers) must be admitted to the Biology or the Allied Health Technology majors by the Office of Admissions upon admission to the University.
- 2. Admission of Millersville University students to the majors (from other departments or undeclared status) requires that the student is in satisfactory academic standing as described in the Undergraduate Catalog. Students who were dropped from a Biology or Allied Health Technology major also must satisfy the Retention in the Major criteria before being readmitted to a Biology major.
- 3. Non-degree and continuing education students must be admitted to these majors by the Office of Admissions.

Retention in the Biology or Allied Health Technology Majors



Since there are so many differences between the various options, please see the Retention in the Major requirements for each option on the following pages:

Biology Majors and Options:

BA BIOL - p. 64

BS BIOL - p.66

BSE BIOL - p. 68

BS BIOL Animal Behavior - p. 70

BS BIOL Botany - p. 72

BS BIOL Environmental Biology - p. 74

BS BIOL Marine Biology - p. 76

BS BIOL Medical Technology - p. 78

BS BIOL Molecular Bio/Biotechnology - p. 80

BS BIOL Nuclear Medicine - 82

BS BIOL Pre-Optometry - 84

BS BIOL Pre-Podiatry - 86

BS BIOL Respiratory Therapy - p. 88

Allied Health Technology Options:

BS ALHT Medical Technology - p. 54

BS ALHT Nuclear Medicine- p. 56

BS ALHT Pre-Athletic Training - p. 58

BS ALHT Respiratory Therapy - p. 60

BS ALHT Sports Medicine - p. 62

Programs in Biology

The Department of Biology offers a variety of programs and options, each of which has specific requirements. In addition, the University has a series of general education requirements which must be satisfied for graduation. Please refer to both the University Catalog and your faculty academic advisor for the details of these requirements. Questions about specific programs in biology can be answered by your academic advisor and by the following faculty with special interest in particular programs:

Animal Behavior Option:

Dr. Boal, Dr. Didier, Dr. Haines, Dr. Hoover

Botany Option:

Dr. Hardy, Dr. Stieha, Dr. Wagner

Environmental Option:

Dr. Boal, Dr. Haines, Dr. Horton, Dr. Wallace, Dr. Yocom

Marine Biology Option:

Dr. Boal, Dr. Didier

Medical Technology Options:

Dr. Cebra-Thomas, Dr. Cosentino, Dr. Whisenton-Davidson

Molecular Biology/Biotechnology Option:

Dr. Cebra-Thomas, Dr. Hepfer, Dr. Klosinska, Dr. Piperberg

Nuclear Medicine Options:

Dr. Cebra-Thomas, Dr. Cosentino, Dr. Hepfer, Dr. Ladd

Pre-Athletic Training Options:

Dr. Cebra-Thomas, Dr. Hoover, Dr. Ladd, Dr. Whisenton-Davidson

Pre-Optometry Option:

Dr. Cebra-Thomas, Dr. Cosentino, Dr. Ladd, Dr. Hoover

Pre-Podiatry Option:

Dr. Cebra-Thomas, Dr. Cosentino, Dr. Ladd

Respiratory Therapy Options:

Dr. Cebra-Thomas, Dr. Cosentino, Dr. Hoover, Dr. Ladd

Secondary Education in Biology:

Dr. Whisenton-Davidson, Dr. Didier, Dr. Piperberg

Biology Colloquium

The purpose of the Biology Colloquium is to bring outstanding scientists to campus to talk to and interact with our students. We strongly believe that these colloquia provide wonderful opportunities and expect that all students who are serious about biology will attend regularly. The colloquia are held at 4:00 pm on Wednesdays. Topics, speakers, and locations are announced via Millersville e-mail and posted around the building each semester.

Health Professions Advisory Committee

"Pre-Med Committee"

Admission to colleges of medicine, dentistry, podiatry, optometry, and veterinary medicine is highly competitive. The selection of students for a place in a class depends on a number of criteria such as the quality grade point average, performance in the required aptitude tests given for the specific profession, letters of recommendation from the University advisory committee, and personal interviews. Millersville University, being aware of the need to counsel those students planning a career in the health professions, has established a committee made up of faculty who are committed to helping qualified students gain admission to professional schools.

Students who indicate their desire to enter professional schools may request an advisor who is a member of this committee. The advisor will heed the needs of the student and supervise their program throughout the undergraduate career. The committee will keep the students informed of admission requirements of the various professional schools and keep them abreast of new developments. The committee will be the student's liaison with the admission officers of the professional school.

The Health Professions Advisory Committee is composed of the following persons:
Dr. Judith Cebra-Thomas, Committee Chair (Biology), Dr. Kelly Banna (Psychology), Dr. Shawn
P. Gallagher (Psychology), Dr. Heather Girvin (Social Work), Dr. Nazli Hardy (Computer
Science), Dr. John E. Hoover (Biology), Dr. Timothy Ladd (Biology), Dr. Aimee Miller
(Chemistry), Dr. Edward Rajaseelan (Chemistry), Dr. Ryan Wagner (Biology), and Dr. Jeffrey
W. Wimer (Wellness and Sport Sciences).

Allied Health Programs

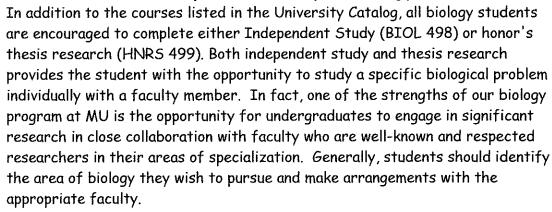
Our Allied Health programs allow students to become health care practitioners directly upon graduation from Millersville University. The Department of Biology sponsors formal programs in Medical Technology, Nuclear Medicine Technology, Respiratory Therapy, and Sports Medicine. In addition, we have informal associations with other allied health professions such as physical therapy. Admission into the clinical phase of the Nuclear Medicine Technology (QPA > 2.5) and Medical Technology (> 3.0) programs is very competitive. Admission into the clinical phase of the Respiratory Therapy program is also competitive (minimal QPA of 2.3). Students in these options must do well in their courses if they want to be considered for the limited number of clinical positions available in the hospital-based portion of their program.

Please consult Dr. Cebra-Thomas for details on these programs.

Departmental Honors

Students who are highly motivated and who wish to pursue a particular area of interest through intensive research are encouraged to consider Departmental Honors. Prior to embarking on an honors research project, students should have explored the problem with a faculty member through an independent study venture. Guidelines for completing Departmental Honors are shown on the next page. Upon successful completion of the thesis, a student will be recognized for achievement at graduation with the designation of *Departmental Honors* on their diploma and University record. The desire to receive this recognition is not sufficient reason to pursue departmental honors; you should possess a genuine desire to solve a problem in life science. To be eligible for this program, students must have a cumulative grade point average of at least 3.0 and the endorsement of a faculty member.





Students find these experiences of great value; expanding not only their knowledge of biology, but their understanding and appreciation of scientific methodology. Independent study projects also have helped students to clarify career objectives and to make decisions concerning further professional education, as well as prepare for graduate study.

The form needed to apply for Independent Study is shown on the following page. Forms are available from the Biology Department Office.

MILLERSVILLE UNIVERSITY REQUEST FOR SPECIAL STUDY ASSIGNMENT

		EQUESTING SPECIAL STUDY		
Student Last Name	First Name	MI		
MAX ID Number	Degree and Major Expected Graduation D			
Local Address		Local Phone		
Student Signature	Date	Email		
Student Adviser Signature	Date			
Student Adviser Information				
Please attach this form a justification	for the student's needs for this	course.		
	TED BY COURSE INSTRU	CTOR OR FACULTY SUPERVISOR		
CHECK ONE:		SPECIAL STUDY COURSE INFORMATION		
INDEPENDENT STUDY (ugrd -use		(print year)		
INDEPENDENT STUDY (grad – co		Fall Summer 1		
INDEPENDENT STUDY (ugrd – us		Spring Summer 2		
INDEPENDENT STUDY (ugrd – us		Winter Summer 3		
INDEPENDENT STUDY (ugrd – us	e 499, for Univ Hnrs College			
Thesis)	T. 6	FACULTY SUPERVISOR/INSTRUCTOR		
INDIVIDUALIZED INSTRUCTION	(ugrd or grad – use catalog	Print name:		
number)		Time name.		
(Includes Graduate Practicum or othe catalogs that are not scheduled in the				
Subject & Course Number (ex. ENG.		urse Title/Topic (ex. Writings of Jane Austen)		
Subject & Course Number (ex. E110)	L 409) Creuits Short Cou	inse Title/Topic (ex. wittings of Jane Austen)		
For the term indicated above, list the total you will supervise, including the credits o		edits and individualized instruction credits		
	sed in any one term. This applies	separate minimum of 9 student credit hours of to fall, spring/winter or the entire summer term		
Faculty Supervisor Signature	Date	MAX ID Number		
		AND PAYMENT AUTHRORIZATION		
Chair of department in which study wi	n occur	Date		
Dean of College in which study will occ	ur.	Date		
Estimated Cost: c: Registrar's Office 9/2015	For Registr	rar's Office use only: CRN		

INSTRUCTIONS FOR PROCESSING "REQUEST FOR SPECIAL STUDY" FORM

Steps Required

Student	1.	Discusses proposed special study with course instructor or faculty supervisor. Completes PART 1, discusses plan with academic adviser and obtains adviser's signature.
Adviser	2.	Discusses request with student, attaches a clear and detailed justification for the study and signs form (PART 1) if approved.
Instructor/Supervisor	3.	Completes all information in PART 2 and signs form. Forwards form to department chair.
Department Chair	4.	Chairperson of department offering course will review special study request form and faculty load information, sign form (PART 3) if approved, and forward form to dean of his/her school.
School Dean	5.	Dean of school offering course will review special study request form and faculty load information, sign form (PART 3) to authorize payment of faculty member, and forward it to Registrar's Office for processing.
Registrar's Office	6.	Process student's registration for special study assignment.
		Notifies Bursar's Office if processing the special study results in a change to the student's billing status.
		Distributes copies of approved special study forms as follows:
		Faculty member supervising special study assignment Budget Office HR Technician in Provost's Office
HR Technician in Provost's Office	7.	Verifies student's registration for and/or completion of special study assignment. Completes the SSHE form for calculation of faculty payment and forwards it to the Payroll Office for processing.
Student	8.	Settles any additional cost resulting from registration for special study credits.
Payroli	9.	Processes SSHE form so that faculty member will be paid. Forwards a copy of completed payment form to the Budget Office.

Procedures for Pursuing Departmental Honors* in Biology (Millersville University)

*NOTE: Although an attempt has been made to integrate University Honors College (UHC) requirements into these procedures, complete information should be obtained from the UHC Program Director. In general, Biology Departmental Honors work should include original research (theoretical, laboratory or field) applied to answer a novel question in a specific discipline. The student should describe and analyze his/her results in a formal written report. The thesis must be defended in a public forum. The students should use the attached check list to document completion of the procedures below.

- 1. To be eligible for Departmental Honors, a student must have a cumulative QPA of 3.0 (3.35 for University Honors).
- 2. Normally, students pursuing Departmental Honors in Biology will explore the feasibility of a potential thesis project by taking one or more credits of BIOL 498 (Independent Study) before their senior year. Once a definite thesis project is planned, the students can take additional credits of BIOL 498 or BIOL/HNRS 489 in the first semester of their senior year and they must complete 1-2 credits of BIOL/HNRS 499 during their last semester. A grade for Departmental Honors (BIOL/HNRS 499) should not be assigned until after the thesis defense is completed and all Thesis Committee members have approved the final manuscript.
- 3. a. To earn Departmental Honors, a student must complete at least one credit of BIOL/HNRS 499 (Departmental Honors Thesis). BIOL/HNRS 499 credits should be completed during the student's final semester before graduation.
- b. A biology student may earn up to 4.0 total credits for their Departmental Honors Thesis project. Usually one or two credits are awarded for BIOL/HNRS 499 (Departmental Honors Thesis), and the remaining credits are earned as students complete BIOL 498 (Independent Study) at the start of their thesis research. Students in the University Honors College (UHC) may substitute BIOL/HNRS 489 ((Honors Independent Study) for BIOL 498 (Independent Study). [NOTE: Additional credits of BIOL 498 (Independent Study) may be earned for work that is not directly related to the thesis project.]
- c. BIOL/HNRS 499 credits (1-3) will satisfy the University's Advanced Writing requirement as long as total credit requirements for the major and for the degree are still met.
- d. Students in the University Honors College (UHC) are required to complete a minimum of 3 credits for University Honors. UHC accepts credits for BIOL 498, BIOL/HNRS 489 and/or BIOL/HNRS 499 in any combination. Up to eight of these credits may to use to fulfill UHC requirements.
- 4. To apply for credit in BIOL 498, BIOL/HNRS 489 or BIOL/HNRS 499, a "Request for Special Study Assignment" form must be completed with a one-page proposal of the thesis project attached. Once signatures of the supervising faculty member and the student's advisor have been obtained, this form and the attachment must be submitted to the Biology Department Chair. This should be done before the start of the semester in which the credits will be earned.
- 5. At least six months before the student plans to defend his/her thesis, a thesis committee should be chosen. The committee shall consist of the faculty supervisor and at least two other Biology faculty members. If the student wishes to earn Honors from the University Honors College, then there must be at least one faculty member outside of the Biology department on the committee. The student, in consultation with the faculty supervisor, should choose faculty who can advise the student in his/her work.

- 6. The student should meet with his/her committee at least twice before the defense. The student and his/her supervisor are encouraged to involve other committee members in the planning and design of the research project. These meetings would be a good opportunity for the student and committee to discuss progress made or difficulties in the research as well as the committee's expectations for the finished thesis product.
- 7. The written thesis shall be a formal presentation and discussion of the student's results. Appropriate background on the thesis topic (Introduction), descriptions of how the results were obtained (Methods and Materials), presentations, descriptions, and analyses of data (Results), and how the results apply to the thesis question (Discussion) shall all be included. The format of the written thesis shall be appropriate for publication in journals of the applicable sub discipline of biology. In addition, no dissertation will be acceptable without proper citations of original literature in the respective field. The thesis paper must also include a title and signature page. Examples of honors theses are available for review in the Biology Department office.
- 8. A first draft of the entire thesis paper shall be submitted to all committee members at least four weeks before the thesis defense. Committee members shall return the draft to the student within one week of receipt with their comments.
- 9. The oral defense should occur no fewer than two weeks before the student graduates from Millersville University. Committee members shall be notified in writing of the date, time and place of the defense at least three weeks before the defense. The defense must be advertised one week in advance by posting notices in the building.
- 10. A revised copy of the thesis shall be distributed to all committee members at least two weeks before the defense. Committee members shall return the draft with their comments to the student immediately after the closed defense (see below).
- 11. The student's defense will include a formal and public presentation (open to all) given by the student and a question/answer session. The public presentation is followed by a closed defense of questions/answers/discussion between the committee members and the student. Honors designation and a grade will be based on the quality of the work (research, paper and presentation) as determined by the thesis committee in a closed session immediately following the closed portion of the defense. To receive Honors credit, a grade of A or B must be earned. Failure in following these procedures may result in the loss of Honors credit so that the status of the credits will be reduced from HNRS 489 or 499 to BIOL 498 (independent study). Note: If Honors credit (HNRS/BIOL 499) is not granted, then the student will be unable to apply his/her thesis credits towards fulfilling the Advanced Writing Requirement in the GENED curriculum.
- 12. The student will prepare the necessary final revisions required for the thesis paper and distribute a final draft to the committee members for approval at least one week before graduation and not more than one week after the defense.
- 13. At least three days prior to graduation, the approved thesis paper shall be signed by the committee members, so that a grade can be issued by the supervising faculty. The committee members, the Biology Department office, and University Archives shall each receive a copy of the approved thesis paper. When appropriate, the University Honors College should also receive a copy.

Honors Thesis Procedures Check List

space provided and have it	mindled by your	Deadline	Deadline Date		
	Step(s) in	(Academic	(work backwards	Completion	Supervisor's
Action	Written	Weeks Before	from Graduation	Date	Initials
Action	Procedures	Graduation)	Date)	Dute	Tillius
QPA ≥ 3.0?	Step 1	30 weeks (two	Date)		
QFA 2 3.0?	31ep 1	semesters)			
D	C+ 2 4	29 weeks			
Register for BIOL 498, 489	Steps 2 - 4	29 weeks			
or 499 (≥1 credit; optional)					
Choose Thesis Committee					
Supervisor (Biology)		24 weeks			
	Step 5	(6 months)			
Member 1 (Biology)	J 3169 3	(0 1110111113)			
Member 2 (Biology)					
Member 3 ()					
First Committee Meeting	Step 6	20 weeks			
Register for BIOL 489 or		15 weeks (one			
499 (≥1 credit)	Steps 2 - 4	semester)			
QPA ≥ 3.0?		15 weeks			

Begin writing thesis (Outline,	Step 7	14 weeks			
Introduction, and M&M)	J 010p /	11 WCCRS			
	Stop 6	12 weeks			
Second committee meeting	Step 6				
	61. /	(3 months)			
Third committee meeting	Step 6	optional			
First full draft of thesis	Step 8	6 weeks			1
paper to thesis committee					
Inform committee of date,	Step 9	5 weeks			
time, and place of thesis	Part of the Part o				
defense					
Second draft (defense-	Step 10	4 weeks			
ready) to Committee					
Advertise public oral	Step 8	3 weeks			
defense					1
Public oral defense	Step 11	2 weeks			
Final revised draft to	Step 12	1 week			
committee	O top 12	I WCCV			
	Stop 12	3 days			
Obtain signatures; copies to	Step 13	3 days			
all committee members		10	<u></u>		

Honors Thesis Procedures Check List:

Directions: Please refer to Steps in written procedures. Decide on a graduation date: May 2, 2009_. Using a calendar, determine deadline dates for actions below by counting back from target graduation date. Fill in appropriate deadline dates. After an action is completed, write the completion date in the

space provided and have it initialed by your supervisor.

		Deadline	Deadline Date		
	Step(s) in	(Academic	(work backwards	Completion	Supervisor's
Action	Written	Weeks Before	from Graduation	Date	Initials
	Procedures	Graduation)	Date)		
QPA ≥ 3.0?	Step 1	30 weeks (two	Aug. 25, 2008		
		semesters)			
Register for BIOL 498, 489 or	Steps 2 - 4	29 weeks	Sep. 2, 2008		
499 (≥1 credit; optional)					
Choose Thesis Committee					
Supervisor (Biology)		24	0.+ 0.2000		
		24 weeks	Oct. 8, 2008		
Member 1 (Biology)	Step 5	(6 months)			
Member 2 (Biology)	THE COLUMN TWO PROPERTY OF THE COLUMN TWO PROPER				
Member 3 ()					
First Committee Meeting	Step 6	20 weeks	Nov. 3, 2008		
Register for BIOL 489 or		15 weeks (one	Jan. 12, 2009		
499 (≥1 credit)	Steps 2 - 4	semester)			
QPA ≥ 3.0?		15 weeks	Jan. 12, 2009		
Begin writing thesis (Outline,	Step 7	14 weeks	Jan. 19, 2009		
Introduction, and M&M)	<u> </u>				
Second committee meeting	Step 6	12 weeks (3 months)	Feb. 2, 2009		
Third committee meeting	Step 6	optional			
First full draft of thesis	Step 8	6 weeks	Mar. 23, 2009		-
paper to thesis committee					
Inform committee of date, time, and place of thesis defense	Step 9	5 weeks	Mar. 30, 2009		
Second draft (defense- ready) to Committee	Step 10	4 weeks	April 6, 2009		
Advertise public oral defense	Step 8	3 weeks	April 13, 2009		
Public oral defense	Step 11	2 weeks	April 20, 2009		
Final revised draft to committee	Step 12	1 week	April 27, 2009		
Obtain signatures; copies to all committee members	Step 13	3 days	April 29, 2009		

Research Facilities

Our facilities include space for microscopy, including phase contrast, fluorescent, epifluorescent, and polarizing microscopes and three ultramicrotomes, a knife maker, and rotary microtomes. A computer station is also available for image analysis. The histology lab is fully equipped for histochemical and paraffin microtechniques. We have dark room facilities, sterile hoods, fume hoods, carbon dioxide incubators, an ultracentrifuge, a scintillation counter, chromatography and electrophoresis apparati, gel dryers, thermocycler, inverted phase microscopes, spectrophotometers, and a variety of other types of equipment available for use by students under the supervision of appropriate faculty members. In addition we have herbarium and museum collections, cold rooms, a large limnological research pond, as well as the Keever Ecological Study Area located on campus for ecological investigations.

The department of biology maintains affiliation with two biological field stations. Both stations are available for use by students doing independent projects. The Chincoteague Bay Field Station at Wallops Island, Virginia (see "Chincoteague Bay Field Station at Marine Science Consortium") has a number of labs, classrooms, research vessels, and equipment for studies of marine and coastal biology. Powdermill Biological Station is a 2000 acre field site in the Laurel Highlands area of Pennsylvania and is operated by the Carnegie Museum of Natural History. Several cabins and laboratories as well as a variety of terrestrial ecosystems are available for use by researchers from Millersville. Although the primary focus of research at Powdermill is population, behavioral, and physiological ecology of vertebrates, opportunities for studies of invertebrates and plants also exist.

Millersville has four separate greenhouses covering over 1200 square feet which affords growing plants under different environmental conditions. Plants grown in these houses are used in research, the classroom, independent study, and for horticultural purposes. A modern potting room with a soil sterilizer and a temperature controlled propagating bench with automatic watering and lighting are a few of the features used often. Besides the greenhouses, there are four large environmental chambers where conditions of light, temperature, and moisture can be controlled and monitored for experimental studies.

Chincoteague Bay Field Station at Marine Science Consortium

Millersville University is a charter member of the Chincoteague Bay Field Station at Marine Science Consortium at Wallops Island, Virginia. The Consortium was established in 1968 to promote teaching and research in marine and environmental sciences. These goals are achieved by pooling faculty, students, and other resources of the member universities.

The marine station consists of classrooms, laboratories, workshops, dormitories, and a dining hall. The Consortium owns and operates several vessels and small boats used in courses and for student-oriented research.

During the summer, the student may enroll in one to four three-week courses. Each course carries three semester hours credit and involves intense, day-long study for the duration of the three-week session. All the courses offered in the college-level program are registered for at Millersville. Subjects include marine biology, marine ecology, oceanography, marine invertebrates, marine ichthyology, behavior of marine organisms, ornithology, tropical invertebrates, wetlands ecology, and others. Most courses involve considerable time working on board the research vessels. Students are exposed to a variety of marine and estuarine habitats learning about the physical and chemical factors that shape these ecosystems as well as studying the organisms themselves. See Dr. Didier, Dr. Boal or Dr. Haines for details about these courses.

Cooperative Education in Biology

Students in biology are encouraged to engage in cooperative education experiences. These projects are cooperative efforts among the University, students, and employers in which the student is employed on a full- or part-time, paid or volunteer, position closely aligned to the career interest and/or academic major of the student. Biology students have received college credit for their experiences and have found meaningful work related to their careers. For example, recently our students have worked in health care in the areas of physical and respiratory therapy and as research technicians at Hershey Medical Center and the National Institutes of Health. Others have worked in environmental regulation for both DER and EPA; some have been naturalists, park rangers, and have done ecological consulting for industry. In addition, students have performed horticultural work for commercial greenhouses and governmental agencies. Our students have found CO-OP experiences to be beneficial in making career decisions, providing breaks from the routine of academic life, and establishing contacts with prospective employers. Several of our students have moved from temporary employee status as CO-OP interns to full-time permanent employees after graduation. We are quite proud of the employment records of the CO-OP students from biology.

For details about this program, contact Dr. Aaron Haines (x7451).

Scholarships and Awards

Our department rewards excellent students in a number of ways. The following departmental and University programs are worth noting!

Scholarships for Incoming Freshmen

Biology Scholarships

Renewable scholarships to biology majors for eight semesters beginning in the freshman year. The annual spendable income will be disbursed equally to fund up to 50% of in-state tuition for qualifying full-time students pursuing a BS, BA, or BSEd in biology. Selection shall be based on merit demonstrated by high school class rank or GPA performance with emphasis on academic performance in math and science courses, standardized test scores (SAT or ACT), and other criteria as determined by the admission office and the biology department.

The James C. Parks Scholarship in Botanical Research

This is an annually renewable scholarship awarded to an incoming freshman with an interest in botany. The recipient of this scholarship is expected to develop a botanical research project in collaboration with a faculty member that will lead to the presentation of research results in the Dr. James C. Parks Memorial Lecture in the recipient's senior year.

Ratzlaff Scholarship Fund

A scholarship awarded to an incoming biology major. Selection shall be based on merit demonstrated by high school class rank or GPA performance with emphasis on academic performance in math and science courses, standardized test scores (SAT or ACT), and other criteria as determined by the admission office and the biology department. The scholarship may be renewed for three additional years providing the student remains a biology major and maintains a QPA of 3.0 or greater.

The Syd Radinovsky Scholarship in Biological Research

This is an annually renewable scholarship awarded to an entering freshman with an interest in biological research. The recipient will develop a research project in collaboration with a faculty member that will lead to the presentation of research results in the student's senior year. Selection shall be based on merit demonstrated by high school class rank or GPA performance with emphasis on academic performance in math and science courses, standardized test scores (SAT or ACT), and other criteria as determined by the admission office and the biology department. The recipient of this award shall be designated as the Syd Radinovsky Scholar.

Sophomore Secondary Education Academic Award

N.E. Shoemaker Biology Teaching Scholarship

A scholarship granted annually to the sophomore secondary education biology major who has earned the highest quality point average.

Research Scholarships - Students Apply for These

Arthur and Claribel Walker Gerhart Memorial Scholarship

Awarded annually to a biology major, usually a sophomore or junior in good academic standing, who is pursuing scientific investigation through independent study in biology.

Keever Biology Research Training Fund

Support provided through a fund established by Dr. Catherine Keever, emeritus faculty member of the Department of Biology, to train students in methods and values of scientific research.

Awarded to undergraduate biology majors to support research investigations. Applications are available in the Biology Office.

Alex Henderson Scholarship

This award is given for a proposal for a project that is interdisciplinary in nature with preference given to sophomores and juniors. Applications are available in the Biology Office.

Biology Student Investigator Grant

Awarded to fund biology research expenses of students enrolled in BIOL 498 (Independent Study) or BIOL 499 (Independent Study leading to Departmental or University Honors College Thesis) and may include costs to attend, to prepare materials for presentation, and to travel to conferences helpful to the student's research efforts. The request for proposals is circulated via Millersville email.

Neimeyer-Hodgson Research Grant

The Millersville University Alumni Association has established the Neimeyer -Hodgson Fund to provide grants-in-aid for student research. Grants are awarded spring and fall semesters. Applications may be obtained from the Alumni Office.

Student Research Grant

MU's Student Research Grant (SRG) program is intended to encourage both undergraduate and graduate students to undertake research and creative projects which will contribute new insights in the student's chosen academic field. Funds requested must be related to the student's course-related research or creative project or to their undergraduate or graduate thesis. Grants will be made up to a maximum award of \$400 and may be used for research-related travel, materials and supplies, research experiments and data collection, books and equipment, and other research needs. Grant submissions will be accepted in the fall and spring semesters for currently enrolled Millersville students, with up to one year from the grant award notification to complete the research project and expend any grant funds. The request for proposals is circulated via Millersville email.

Non-Research Scholarships - Students Apply for These

Rachel Carson Biology Field Course Scholarships

These scholarships will be disbursed as credit toward tuition, fees, room and board, and travel expenses for student pursuing credits in biology field courses. At least two awards will be given annually; the minimum award will be \$1,000. Recipients must be in good academic standing overall

and within their academic major and pursuing a BA, BS or BSE in the sciences or mathematics. Preference may be given to marine biology option students.

Liddell Field Study Endowment

This award is given to students registered for field biology courses that require residence at Wallops Island (or other similar field studies).

Awards Selected by Department or School

Henry Franklin Bitner Science Prizes

Two Bitner Prizes are given annually, one in physical science and one in biological science. Teachers of these sciences, together with the Dean of the School of Science and Mathematics, shall recommend to the faculty the senior students best qualified for these awards.

Commonwealth of Pennsylvania University Biologists (CPUB) Award

Given on the bases of academic standing and excellence in biology and research potential.

The Antone K. Fontes Health Professions Award

Reference books presented to students who are completing their studies at MU and who have demonstrated outstanding ability in the premedical/predental, nursing, and allied health programs. One student is selected from each of the three areas on the basis of quality point average and recommendations.

James Groff Scholarship

Awarded to a student who has demonstrated strong academic performance in a course of study which may lead to a degree in medicine and who has demonstrated financial need.

Robertson Endowed Library Garden Botany Internship

Awarded to a rising sophomore, junior or senior with first preference to Botany option Biology majors, who must demonstrate an interest in pursuing advanced study or a career in horticulture, horticultural taxonomy, landscape design or other related disciplines in botany.

Charles D. Spotts Naturalist-Humanist Award

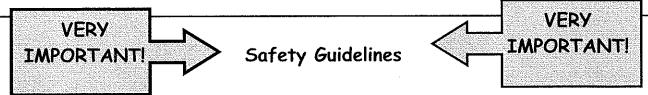
A cash award made to the upper division student who, in the opinion of the Entomology Club, has contributed most to the naturalist humanist ethic.

Charles R. Winter Award in Pre-Med

A cash award (in the form of a tuition credit) to a student who has demonstrated strong academic performance in a course of study which may lead to a degree in medicine.

Dr. William Yurkiewicz Undergraduate Research Fellowship

A fellowship to a student who is conducting research with a high probability of publication in a peer-reviewed journal.



The joy of any investigation can be tarnished by an accident! Use prudent practices in your research at all times. Please employ the following precautions:

- 1. Report all accidents, however minor, to your instructor or supervisor immediately. Contact the University Police in case of an emergency (911).
 - 2. Avoid working alone in the field and in the laboratory.
- 3. Obtain advice from your instructor or supervisor whenever you modify or design your experiments. When conducting experiments, ask yourself: "What are the worst possible things that could go wrong?" and "How will I respond to these problems?" Do not begin an experiment until you are certain of your answers. It is particularly important to be well informed about the toxicity of all chemicals you will use. Read the labels on all chemical containers and take appropriate precautions.
- 4. Wear sensible clothing; avoid loose sleeves, hanging jewelry, etc. A laboratory coat, safety glasses and disposable gloves should be worn in research laboratories and in course-related laboratories when you are instructed to do so. Wear appropriate field garb to protect you from the elements and field community.
- 5. Know the exact location of all safety equipment: eye wash stations, fire extinguishers, showers, first-aid kits, spill containment supplies, etc.
 - 6. Use a fume hood when working with volatile substances.
- 7. Keep the laboratory bench and work area orderly, clean and free of items not related to the experiment. Organize fieldwork so that minimal equipment is needed.
- 8. Dispose of waste material, broken glass, and excess chemicals as indicated by your instructor or supervisor.
 - 9. Food and drink are not allowed in the laboratory.
- 10. Special instructions and procedures are required before you are permitted to use radionuclides. You must complete a training form before using these substances. Be sure to obtain this form before you begin working with any radioactivity.
- 11. You are responsible for your safety during the course of an investigation.



Student Organizations are a great way to meet other students with your interests and to learn more about specific areas of Biology!

The Aesculapian Society:

Advisor: Dr. Cebra-Thomas

Advisor: Dr. Wagner

The Aesculapian Society is a club open to all students interested in careers in medicine, dentistry, podiatry, and many areas of the allied health professions. The Society endeavors to cultivate and encourage scholarly excellence in the field of health-related sciences. The club sponsors seminars featuring speakers from a variety of health fields. The members make frequent visits to professional schools, hospitals, and industrial laboratories during the year. The club is dedicated to volunteer involvement in programs, such as the Heart Fund and the National Foundation of the March of Dimes.

Biology Club:

The Biology Club invites members from the entire campus as well as from the Biology Department. The activities of the club are numerous and include speakers from other institutions; career seminars; field trips to greenhouses, zoos, and primate laboratories; government experimental stations; mushroom factories; biotechnology facilities; aquaria; and several arboreta and gardens including the National Arboretum in Washington, D.C. and Longwood Gardens. This club prepares the newsletter "Biorhythms". Its meetings often include films on various aspects of biology. There is often a visit to the Philadelphia Flower Show and an overnight trip to Washington, D.C. or New York. On Arbor Day, the Club presents a flowering tree to the University to be planted at some appropriate place on campus. The Club has also established and maintains a nursery of trees planted on campus. It financially supports itself by organizing raffles, car washes, plant and food sales.

Conestoga Club:

Advisor: Dr. Haines

The Conestoga Club was formed in 1996 to educate the community about local natural environments. We are working on natural history brochures about the "Bush", a forested campus area along the Conestoga River. We plan to lead hikes and also encourage people to take self-guided tours. Restoration of native wildflowers and other vegetation is another club project. During Spring 1996, Virginia bluebells were planted. The club is now establishing seed beds for native wildflowers, which will be transplanted to the Bush and other local areas.

Entomology Club:

The Entomology Club was organized in 1964. The purposes and functions of this club include local and extended field trips to study the flora and fauna of nearby and far-away habitats. Trips are taken to the Florida Keys, the Everglades, Central and Northern Florida, Okeefenokee Swamp, Cape Hatteras, Wallops Island, Chincoteague and Assateague, the pine barrens of New Jersey, and Big Bend National Park in Texas. Although the emphasis of the club is insects, all animal groups are studied.

Advisor: Dr. Wallace

Advisor: Dr. Hoover

Advisor: Dr. Didier

Millersville University Society for Respiratory Care Practitioners:

The Millersville University Society for Respiratory Care Practitioners, chartered in 1997, was founded to serve students who have interest in respiratory care practice. The society meets monthly during the academic year to plan and conduct field trips, make facility tours, and enjoy speakers who come to share their experiences and insights regarding respiratory care practice. The society maintains communication with representatives of the American Lung Association, and members volunteer their time to work with children and adults who seek its services. Its goal is to promote enthusiasm and scholarship of students in the respiratory therapy curriculum, increase awareness of the respiratory care profession, advance the role of the respiratory care practitioner in health care, and promote the cardiopulmonary wellness of all people in our community.

Ocean Sciences Club:

The Ocean Sciences Club is open to anyone interested in the marine environment. We have invited speakers to talk about their research, graduate schools, and career opportunities. Field trips include beach cleanups along the Delaware shore, visits to the National Aquarium in Baltimore, the Smithsonian Institute, the open house for graduate school at the University of Delaware, as well as a boat trip in the Chesapeake Bay.



Because of the very inter-disciplinary nature of biology and because many of the world's problems have a biological basis, we believe that our curricula in biology provide students with a strong preparation for many careers as well as for advanced study. The various options in biology permit students to explore specific areas of biological science while maintaining a strong foundation in the discipline.

Your academic record includes much more than a grade-point-average. The courses you take, the knowledge you gain from your courses and from study outside formal course material, the independent study project(s) you pursue, the work experience you receive, the colloquia and seminars in which you participate, the scientific meetings you attend, the papers you present at meetings or publish in scientific journals, the leadership roles you assume in student organizations, and your volunteer community service will all make you a very competitive candidate in your future endeavors. Students at Millersville find time to add the activities mentioned above to their busy schedules, even with a full course load. The best way to prepare for the future is to participate in the Millersville community today.

Career Services

The offices for Career Services are located in Bedford House and can be reached by phone at $\times 7655$. A modest library of career opportunities is located in Bedford House; in addition, personnel are available to help you match a career with your interests. Information on the development of a sound resume or *curriculum vitae* is also available at Bedford House.

McNairy Library & Learning Forum

In addition to a collection of all current catalogs for colleges, universities, graduate and professional schools, the reference section of McNairy Library contains a number of volumes which describe and evaluate graduate school programs. If you have an interest in a particular profession or sub-discipline of biology, perhaps you should use the *Encyclopedia of Associations* in the reference section of McNairy Library to identify the locations of the main office of the organization, the phone number(s), and chief officer(s). These organizations are most willing to provide literature which describes professions and employment prospects for the future. Use the computer data bases in the reference section of McNairy Library to evaluate the financial health of a company with which you may wish to work.

Cooperative Work Experience

Employers and graduate/professional schools are often impressed with students who have had some work experience in the discipline they are about to enter. Not only does work experience demonstrate a student's interest in a particular vocation, but it illustrates that the student has had a "taste" of the work and desires to do more; these candidates are more likely to be successful when compared with an inexperienced individual. See the section on Cooperative Education in Biology.

Department of Biology Information

The Department of Biology receives thousands of fliers and informational bulletins about special courses, workshops, graduate and professional school programs. These are sorted according to discipline and filed in the file holders on the wall adjacent to Roddy 282. Should you locate some information of particular interest to you, feel free to copy the pertinent information and return the original to the holder so that others may use it.

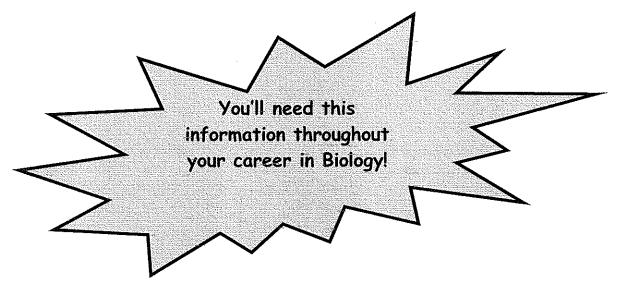
Some of the short course or workshop material is placed in the bulletin board across from Roddy 288. The faculty of the Department of Biology is an excellent source of information.

Allied Health Coordinator: Dr. Cebra-Thomas

Dr. Ladd is the Allied Health Coordinator for all students with an interest in the health professions. In order to introduce students to a variety of opportunities in the health professions, the department of biology offers a one credit course: Introduction to the Allied Health Professions (BIOL 257). Information about the allied health programs and application procedures for internships and professional school admissions can be obtained from the Allied Health Coordinator.

Graduate and Professional Schools

Many students decide that they want to proceed with their education in graduate and/or professional schools. While it is often desirable for students to gain some work experience prior to proceeding to post-graduate education, the groundwork for advanced education should be initiated while the student is in his/her third year. Identify the profession and/or sub-discipline of biology you desire to pursue with advanced study. Then use the reference section of McNairy Library to learn about viable programs. You should write to schools of interest in order to obtain information on the major thrusts of inquiry within a particular department/school. In addition, you should begin to read the literature of professors with whom you may wish to work. Professional and graduate schools all have entrance requirements, obtain application forms early to learn what is required of you and develop a time line so that you will be able to complete applications in a timely fashion. Leave ample time to prepare for examinations, such as the Graduate Record Exam (GRE) or the MCAT required of students applying to medical schools.



How to Write a Laboratory Report or Scientific Paper

A scientific report is a method of communication, an attempt to tell others about some specific data that you have collected and about what you think the data mean. To enable the reader to quickly comprehend the main points of someone's work, the scientific paper is written in a clear and concise manner using the following standard format:

TITLE
INTRODUCTION
METHODS AND MATERIALS
RESULTS
DISCUSSION
LITERATURE CITED

The above format is the one that you may be required to use for your laboratory reports. Note that all the section headings are centered on their respective pages; the body of each section then follows immediately behind the section heading.

TITLE

The most important thing about the title is that it be self-explanatory; for example, a title such as *A Biology Lab Report* tells the reader nothing about the content of the paper. An example of a good self-explanatory title would be: *The Effects of Light and Temperature on the Growth of Sunflowers*. Here the title explains exactly what the worker has done.

INTRODUCTION

The Introduction contains the <u>statement of the problem</u> as well as background information. The researcher states the purpose of the investigation, that is, the specific question(s) that he or she is trying to answer as well as his or her hypothesis. The researcher also describes relevant information that has been found out about the problem, including research that has been done on the problem in the past. (This information is usually found through library research.) The author also discusses how the present experiment will help to clarify or expand understanding in this general area. All background information that the researcher has gathered from other sources (textbooks, journals, etc.) must be properly cited.

There are several ways to cite references in a scientific paper; the method used is usually determined by the journal in which that paper is to be published. The method described here applies to many scientific papers and is the method you will be expected to use in your reports. (note: scientific papers do not use footnotes)

If you have stated some information that needs referencing, put the name(s) of the author(s) of that information in parentheses at the end of the statement. The name(s) should be followed by the date of the publication in which the information appeared. For example:

Ecdysone is a steroid hormone which is important in the growth and development of insects (Wigglesworth, 1970).

In some cases, you may have mentioned the name(s) of the author(s) in the statement itself. In that case, simply put the date of the author's publication in parentheses behind the name. For example:

Pongs (1985) suggests that there is a limited number of ecdysone receptor proteins relative to puff binding sites.

If there are more than two (2) authors to be cited for any one reference, the citation is usually abbreviated as follows:

The ecdysone-receptor complex may directly induce late RNA puffing in fruit flies (Dworiczak <u>et al</u>, 1983).

If you mention information that was given to you by personal communication (letter, telephone, personal conversation), cite that reference as follows:

There is likely to be more than one type of ecdysone receptor in fruit flies (L. Riddiford, pers. comm.).

<u>But</u> it is always best to use a published reference rather than a personal communication, if that information is available in published form.

METHODS AND MATERIALS

In this section, the researcher describes in paragraph form the experimental design, the experimental apparatus, the methods of gathering data and the type of control that was used. If any work was done outdoors in a natural habitat, the researcher describes the study area and states its location. If any specimens were collected for the study, the researcher states where and when that material was collected. In this section, photographs, maps, diagrams, etc., can be used to aid in describing the experimental set-up. The rule to keep in mind is this: the Methods and Materials section should be detailed and clear enough so that readers could duplicate the experiment if they wished to do so. Assume that the reader has as much background in science as the author. For some lab reports, your instructor may indicate that this section can be modified so that you can just refer to your lab manual instead of repeating certain procedures.

RESULTS

The researcher presents the data for inspection by the reader. The results are presented in a straightforward manner, with no conclusions or value judgments as to what the data might mean. If possible, data are assembled into tables and/or graphs to supplement the text and to present the data in an easily understandable form. If tables and graphs are used, they must be accompanied by a narrative text. The text describes the results that are presented in the tables and graphs and calls attention to what the researcher considers to be the significant data. Remember - this section contains text as well as graphs and tables!

DISCUSSION

In this section, the researcher suggests what the results mean. The writer describes any patterns, relationships or correlations that emerged in this study. Basically, the researcher tries to tell why the results turned out the way they did. This includes any explanations as to why the results turned out differently than expected (the incubator broke down, errors in measurement, etc.). It is very important in the Discussion section to look critically at the procedures used and to discuss thoroughly the possible sources of error in the experiment.

In general, the researcher discusses whether the original hypothesis is supported or not supported by the data, and why or why not. The writer also compares the results to the information that is already known about the problem, such as from previous experiments or observations made by the author or by others (the background information that was mentioned in the Introduction). The author should not be afraid to indicate that the results do not support the original hypothesis. Perhaps another hypothesis can be suggested which may explain the problem or answer the question more accurately. The researcher might also suggest further investigations that could be done on the general problem.

LITERATURE CITED

This section lists, in alphabetical order by author's last name, all published information that was referred to in the paper. The actual details of punctuation and format vary somewhat depending on the journal. However, for the sake of uniformity, we will use a format, which is standard for most biological journals:

If your citation is from a journal article:

Cherbas, L., Lee, K. and P. Cherbas. 1991. Identification of ecdysone response elements. Genes Dev. 5: 120-131.

If your citation is from a book:

Sambrook, J., Fritsch, E.F., and T. Maniatis. 1989. *Molecular Cloning: A Laboratory Manual, 2nd ed. Cold Spr. Harb. Lab. Press, New York.*

REFERENCES:

Pechenik, J.A. 1987. A Short Guide To Writing About Biology. Little Brown and Co., Boston.

PREPARATION OF TABLES AND GRAPHS

Raw, unprocessed numbers derived from experiments are often difficult to comprehend. Converting such data to a thoughtfully prepared table or graph can make the interpretation and understanding of your lab findings much easier. A good table or a graph is, in essence, a snapshot that allows a reader to see the significance of your experimental findings at a glance. This should be your overriding concern when preparing a data summary; i.e., does your table or graph clearly and easily convey a biological story?

TABLES. Note the features of the following table:

- -Tables are labeled and numbered.
- -A table contains an explanatory caption. The caption should contain enough information so that the table 'stands by itself;' that is, the reader is able to understand the significance of the table without sorting through other materials.
- -Headings are placed over each column and clearly indicate the units of measure.

Table I. World population by decade from 1950 - 2000 with projections for the years 2010 and 2020.

YEAR	POPULATION (billions)	
1950	2.529	
1960	3.023	
1970	3.686	
1980	4.438	
1990	5.290	
2000	6.115	
2010	6.909	
2020	7.674	

Source: United Nations, 2009. The 2008 Revision Population Database. http://esa.un.org/unpp/

<u>FIGURES</u>. The information presented in Table I may also be presented as a graph:

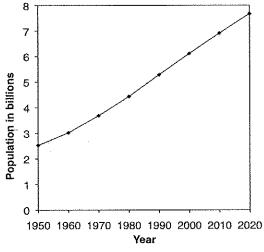


FIGURE 1. World Population by decade from 1950 - 2000 with projections for the years 2010 and 2020. (Source: United Nations, 2009. *The 2008 Revision Population Database.* http://esa.un.org/unpp/).

Graphs are commonly found in scientific publications because trends and relationships can be easily seen. These trends are often missed when perusing complicated tables. A quick glance at Table I might lead to the conclusion that there has been a steady (i.e., straight line) world population growth since 1950. Figure 1, however, clearly shows that population growth accelerated (curved up) each decade from 1950 to 1990 and after 1990 is slowing down slightly. Note the features of Figure 1:

-Graphs are labeled and numbered. Note in particular that graphs are referred to as 'figures.'

- -Figures like tables, contain explanatory captions. The caption should contain enough information so that the figure 'stands by itself;' that is, the reader is able to understand the significance of the graph without sorting through other materials.
- -The axes are clearly graduated and labeled; the units are evident. The graduations on each axis are consistent, covering the entire range of values. The graph is a size that appropriately fills the graph paper, which you may construct yourself using http://incompetech.com/graphpaper.
- -Data points may be connected by a line or curve to illustrate a trend or relationship.
- -If more than two lines are presented on one graph, the types of data points and lines should differ for the two sets of data.
- -The x-axis (horizontal axis or abscissa) usually contains the parameter that we are able to manipulate in an experiment (the independent variable). The y-axis (vertical axis or ordinate) is the response (the dependent variable) to this manipulation. When dealing with a timed response, time is usually plotted on the x-axis.

<u>SLOPE OF A LINE</u>. Recall that a straight line on a graph can be described by the formula y = mx + b; where m is the slope and b is the y-intercept. The slope (or rate of change) tells us about the change of y in comparison to x. A rate of change you constantly deal with is the readout on an automobile's speedometer; your speed (also called velocity) is the change of your position in miles/hour. Rates that we deal with in biology lab include the rate of an enzymatic reaction, the rate of fermentation, the rate of photosynthesis, the rate of respiration and the rate of growth.

On a graph, with a straight line, the slope is determined by choosing two points on the line and then determining the y values and x values for these points. The slope is the difference in the y values divided by the difference in x values. In other words, $m = (y_1 - y_2) \div (x_1 - x_2)$ or $m = \Delta y/\Delta x$. Figure 2 demonstrates the determination of a slope.

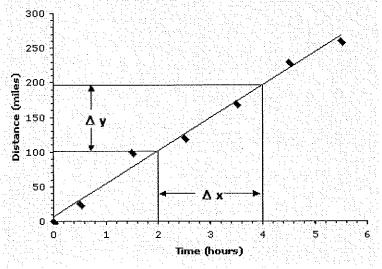


Figure 2. Distance traveled by an automobile over time. A straight line was fitted to the data points. The slope of this line represents the average rate (i.e., velocity) traveled by the automobile during this trip. The slope = $\Delta y/\Delta x = 94$ miles / 2 hours = 47 miles per hour.

Reference:

J.A. Pechenik, 1987. A Short Guide to Writing about Biology., Little, Brown and Co. Custom Graph Paper: http://incompetech.com/graphpaper

BIOLOGICAL LITERATURE

The lifeblood of any modern scientific discipline is the written literature, and it is essential that students learn to use this body of information effectively, both inside and outside of the classroom setting. Often, the beginning student is unsure of what types of information resources are acceptable for use in an academic environment - there is so much available on the Internet and in the Library. Finding scholarly scientific literature on a topic requires information seeking skills and critical thinking skills to evaluate the material found. It is easy to become overwhelmed by the amount of information published on the Internet and, more specifically, the hundreds of thousands of articles published annually in the thousands of biological periodicals. This appendix is intended to familiarize you with ways of accessing the biological literature.

Types of Scientific Literature

There are four broad categories of scientific literature:

- 1. <u>Primary Literature</u>. These are reports of original research, usually appearing in scientific periodicals. Examples of primary literature are articles that appear in the widely circulated, multidisciplinary journals *Science* and *Nature*. These reports represent the factual foundation of any scientific discipline.
- Secondary Literature. Often called 'review articles,' these papers examine a number of primary research articles and provide an overview and interpretations of recent developments in a specific area. Scientific American is an example of a secondary level journal.
- 3. <u>Tertiary Literature</u>. This literature includes textbooks, encyclopedias, bibliographies and other reference books. These works usually summarize the most important facts and ideas about general subjects. It may take several years for new ideas to appear in the tertiary literature.
- 4. <u>Internet Sources</u>. Today the Internet is a tremendous resource and its ready availability often makes it the first place a student turns for information. It can provide a wide range of material, including all of the categories of scientific literature mentioned above. It can also, just as easily, provide access to information that is untrue or biased. It is essential that a student know how to evaluate Internet material.

The Internet also provides the means to access scientific literature through the Millersville University McNairy Library website. Scientific literature can be found by searching the Online Library Catalog (Finding Information / books (and more)) and the periodical indexes (Finding Information / articles). These materials are purchased to meet your research needs.

Searching the Biological Literature

Given a literature assignment, students frequently begin and end their search on the Internet. The Internet is a good place to start but it does not come close to fully covering scholarly scientific literature. Indexes to most scientific literature still must be purchased by individual subscribers or libraries. To get an accurate, complete picture of a scientific topic

you must move beyond the Internet and learn how to use Library provided materials and databases, most importantly the Online Library Catalog and Periodical Indexes.

To obtain a wide perspective as well as the current information on a biological topic, use the following research technique:

- 1. Consult a general information resource. Examples are:
 - Textbooks
 - Reference books Encyclopedias, Dictionaries
 - Search the Internet, focusing on more credible sites such as Government (Science.Gov)
 or Educational sites. The Internet encyclopedia Wikipedia can also be consulted, paying
 attention to references cited and external links to other sites.

All of these resources will familiarize you with the general ideas and terminology of your topic of interest. You may use them to help you decide what it is that you want to research, what are the important questions and issues surrounding a scientific topic. None of these resources should be considered definitive in writing a college level paper, and all of the material should be verified with other resources. Again, look for references cited; they will provide you with additional sources of information.

- 2. Focus on your topic of interest by looking at the secondary literature.
 - a. Check the Online Library Catalog (*Finding Information / books (and more)*) for books and government documents in the McNairy Library that address your research question.
 - b. Search in a broad **Periodical Index** (*Finding Information / articles / General*) such as *Academic Search Premier*. This database indexes both primary and secondary literature in a wide range of disciplines and includes some magazine and newspaper content as well.
 - c. Examine 'review serials' for current information. These serial publications exclusively contain review articles from specified areas. The advantage of a review article is that an authority in an area has examined many articles from the primary literature, has summarized them and has interpreted how they fit into 'a bigger picture.' Examples of review serials are: Annual Review of Microbiology, Annual Review of Physiology, Annual Review of Physiology, News in Physiological Sciences (NIPS), Physiological Reviews, and many others. Access to these titles can be determined by using the Online Library Catalog (Finding Information / books (and more)) or the Journal Finder (Finding Information / journal finder).
- 3. Once you have formulated your research question, it is time to find out what is in the primary biological literature. What is known about this topic, what research has been done and what were the results? The contents of major biological journals are indexed in a **Periodical Index**. The publication titles, article titles, authors, publication dates, and pages numbers along with abstracts and more can be found in these indexes. Access to the most important biological periodical indexes is through electronic databases purchased by the Library and is available from the Library website (*Finding Information / articles*).

<u>Major Indexes</u>

<u>Biological Abstracts</u>: <u>Biological Abstracts</u>®, produced by BIOSIS, is a complete collection of bibliographic references covering life science and biomedical research literature published from more than 4,000 journals internationally. This database contains nearly 9.5 million archival records from as far back as 1926, with more than 370,000 citations added each year.

<u>BioOne</u>: The BioOne bibliographic database is an indexed and fully searchable collection of abstracts that link to the full-text articles available from the BioOne organization. BioOne provides a unique aggregation of over 65 high-impact bioscience research journals from more than 50 publishers.

<u>Chemical Abstracts</u>: An index that monitors over 14,000 periodicals, patent documents, conferences, government reports and books. Molecular, cellular and biochemical aspects of biology will be indexed in *Chemical Abstracts*.

Other Indexes

<u>Academic Search Premier:</u> This multi-disciplinary database provides full text for nearly 4,500 journals, including full text for more than 3,600 peer-reviewed titles. PDF backfiles to 1975 or further are available for well over one hundred journals, and searchable cited references are provided for 1,000 titles. *Academic Search Premier* is updated on a daily basis via EBSCOhost.

<u>Agricola:</u> This database contains bibliographic records from the U.S. Department of Agriculture's National Agricultural Library. Coverage for AGRICOLA dates back to 1970 and includes more than 4.3 million citations.

<u>MEDLINE</u>: <u>MEDLINE</u> provides authoritative medical information on medicine, nursing, dentistry, veterinary medicine, the health care system, pre-clinical sciences, and much more. Created by the National Library of Medicine; search citations from over 4,800 current biomedical journals.

The information and concepts in many branches of biology are changing rapidly, and papers published only a few years ago may be out of date. Also, it should be noted that there is about a six month lag between publication of an article and its appearance in one of the above indexes.

An Example of a Literature Search

Suppose we are interested in finding some current research that deals with mercury in the environment.

- 1. First we must select appropriate keywords-words to describe what we want to know-words that we will find in articles about our topic. We may want to start with the keywords: mercury and environment.
 - You can first check the Internet to get some general information about issues surrounding mercury in the environment. You will find many government websites addressing the issue and articles on Wikipedia. At the end of the Wikipedia article you will find references and external links to more information.
- 2. Next, use the Online Library Catalog to see if the Library has any books or government documents concerning mercury in the environment. Search with your keywords. Refine your search depending on the number and appropriateness of results.
- 3. Check the primary and secondary literature in Academic Search Premier for some articles about mercury in the environment.
- 4. At this point you should know what the issues are concerning mercury in the environment and you may need to refine your research question and keywords to search the primary literature. Articles will be more focused in this literature, and to obtain a manageable number of results, you may need to be more focused with your keywords. For instance,

search *Biological Abstracts* (*Finding Information / articles / Biology*) for scholarly articles on mercury in tuna.

Type in your keywords (mercury and tuna)

Your search will provide you with abstracts of articles containing your key words. Here is the third abstract that appeared from the search:

Daily intake of arsenic, cadmium, mercury, and lead by consumption of edible marine species By: Falco, Gemma, Llobet, Juan M.; Bocio, Ana; Domingo, Jose L. Source: Journal of Agricultural and Food Chemistry, Vol. 54 (16). AUG 9 2006_6106-6112. [Article]. Major Concepts: Biochemistry and Molecular Biophysics; Pollution Assessment Control and Management; Nutrition; Foods; Abstract: The daily intake of arsenic (As), cadmium (Cd), mercury (Hg), and lead (Pb) through the consumption of 14 edible marine species by the general population of Catalonia, Spain, was estimated. Health risks derived from this intake were also assessed. In March-April 2005, samples of sardine, tuna, anchovy, mackerel, swordfish, salmon, hake, red mullet, sole, cuttlefish, squid, clam, mussel, and shrimp were randomly acquired in six cities of Catalonia. Concentrations of As, Cd, Hg, and Pb were determined by ICP-MS. On the basis of recent fish and seafood consumption data, the daily intake of these elements was calculated for eight age/sex groups of the population. The highest As concentrations were found in red mullet, 16.6 mu g/g of fresh weight, whereas clam and mussel (0.14 and 0.13 mu g/g of fresh weight, respectively) were the species with the highest Cd levels. In turn, swordfish (1.93 mu g/g of fresh weight) and mussel and salmon (0.15 and 0.10 mu g/g of fresh weight) showed the highest concentrations of Hg and Pb, respectively. The highest metal intake through fish and seafood consumption corresponded to As (217.7 mu g/day), Cd (1.34 mu g/day), and Pb (2.48 mu g/day) for male seniors, whereas that of Hg was observed in male adults (9.89 mu g/day). The daily intake through fish and seafood consumption of these elements was compared with the provisional tolerable weekly intakes (PTWI). The intakes of As. Cd. Pb. and total Hg by the population of Catalonia were below the respective PTWI values. However, the estimated intake of methylmercury for boys, 1.96 mu g/kg/week, was over the PTWI. (AN BACD200600426840)



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credits: This appendix was prepared by L. Reinking and updated by M. O'Malley (6/07).

Faculty Department of Biology

DR. JEAN G. BOAL

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Areas of Specialization: Animal behavior and marine biology.

Research Interests: Cognitive behavior and sensory perception in animals, especially cephalopods.

<u>Techniques/Procedures Commonly Used</u>: A variety of observational techniques to quantify behavior in the lab and field, including ethograms, video image analysis, mazes and other apparatuses; statistics.

<u>Courses Taught</u>: General Biology, Marine Biology, Seminar in Marine Biology, Principles of Ecology & Evolution, the Natural History of the Mid-Atlantic Shore, Animal Behavior, Behavioral Biology, Seminar in Animal Behavior, Evolution, Special Topics (Animal Cognition, Fish Behavior, Cephalopod Biology).

Recent Publications: (*student)

- In press. Navigation in cephalopods. In: Cephalopod Cognition. (A-5 Darmaillacq, ed.) Cambridge Univ. Press (with C. Jozet-Alves and A-5 Darmaillacq).
- 2012. A Preliminary Analysis of Sleep-Like States in the Cuttlefish Sepia officinalis. PLoS ONE 7(6): e38125. doi:10.1371/journal.pone.0038125 (with M. Frank M, R.H. Waldrop* M. Dumoulin*, and S.J. Aton).
- 2011. Behavioral research methods for working with octopuses and cuttlefishes. Vie et Milieu 61: 203-210.
- 2011. Distance chemoreception and the detection of conspecifics in *Octopus bimaculoides*. Journal of Molluscan Studies 77: 309-311. doi: 10.1093/mollus/eyr009 (with M.D. Walderon*, K. Nolt*, R.E. Haas*, K.N. Prosser*, J.B. Holm*, and G.T. Nagle).
- 2011. Extreme aggression in male squid induced by a ß-microseminoprotein-like pheromone. Current Biology 21(4): 322-327. doi: 10.1016/j.cub.2011.01.038. (with S.F. Cummins, K.C. Buresch, C. Kuanpradit, P. Sobhon, J.B. Holm*, B.M. Degnan, G.T. Nagle and R.T. Hanlon RT).
- 2010. Early explosure to odors changes later visual prey preferences in cuttlefish. Journal of Developmental Psychobiology 52(8):833-7. doi:10.1002/dev.20470 (with M. Guibé* and L. Dickel).
- 2010. Sexually mature cuttlefish are attracted to the eggs of conspecifics. Journal of Chemical Ecology 36(8):834-836 doi: 10.1007/s10886-010-9816-0 (with K.N. Prosser*, J.B. Holm*, T.L. Simmons*, R.E. Haas* and G.T. Nagle).
- 2008. Short-distance navigation in cephalopods: a review. Cognitive Processing 9(4): 239-247. doi: I 10.1007/s10339-007-0192-9 (with C. Alves and L. Dickel).
- 2007. Octopuses (*Octopus bimaculoides*) and cuttlefishes (*Sepia pharaonis*, *S. officinalis*) can conditionally discriminate. Animal Cognition 10(4):449-459. doi: 10.1007/s10071-007-0085-4 (with L.M. Hvorecny*, J.L. Grudowski*, C.J. Blakeslee*, T.L. Simmons*, P.R. Roy*, J.A. Brooks*, R.M. Hanner*, M.E. Beigel*, M.A. Karson, R.H. Nichols* and J.B. Holm*).
- 2007. UV Light Influences covering behavior in the urchin *Lytechinus variegatus*. Journal of the Marine Biological Association 87: 1257-1261. doi: 10.1017/@0025315407055865. (with J.E. Sigg* and K.M. Lloyd-Knight*).
- 2007. Laterality in Octopus Eye Use? Animal Behaviour Forum 74(3):e1-e2. doi: 1016/j.anbehav.2006.12.026 (with J.W. Fenwick).
- 2006. Social recognition: a top down view of cephalopod behaviour. Vie et Milieu.
- 2006. Orientation in the cuttlefish Sepia officinalis: response versus place learning. Animal Cognition (with C. Alves*, R. Chichery, and L. Dickel).
- 2005. Behavioral responses of juvenile cuttlefish Sepia officinalis to local water movements. Marine and Freshwater Behaviour and Physiology 38(2): 117-125 (with S. Komak, L. Dickel and B.U. Budelmann.

- 2004. Behavioral evidence for intraspecific signals with achromatic and polarized light by cuttlefish (Mollusca: Cephalopoda). Behaviour 141: 837-861 (with N. Shashar, M. Grable*, K. Vaughan*, E. Loew and R. Hanlon.
- 2004. Experimental evidence that ovary and oviducal gland extracts influence male agonistic behavior in squids. Biological Bulletin 206: 1-3 (with K.C. Buresch, G.T. Nagle, J.Knowles*, R. Nobuhara, K. Sweeney* and R.T Hanlon).
- 2003. Experimental evidence for spatial learning in cuttlefish (Sepia officinalis). Journal of Comparative Psychology 117(2): 149-155 (with M.A. Karson* and R.T. Hanlon).
- 2003. Contact chemosensory cues in egg bundles elicit male-male agonistic conflicts in the squid Loligo pealei (Mollusca: Cephalopoda). Journal of Chemical Ecology. Vol 29(3): 547-560 (with K.C. Buresch, J. Knowles*, J. DeBose*, A. Nichols*, A. Erwin*, S.D. Painter, G.T. Nagle and R.T. Hanlon).
- 2000. Observational Learning Does Not Explain Improvement in Predation Tactics by Cuttlefish (Mollusca: Cephalopoda). Behavioural Processes 52: 141-153 (with K.M Wittenberg* and R.T. Hanlon).
- 2000. Experimental evidence for spatial learning in octopuses. Journal of Comparative Psychology 114: 246-252 (with A. Dunham*, K. Williams* and R.T. Hanlon).
- 2000. Effect of early experience on learning and memory in cuttlefish. Developmental Psychobiology 36: 101-110 (with L. Dickel, J.G. Boal and B.U. Budelmann).
- 2000. Cuttlefish use polarization sensitivity in predation on silvery fish. Vision Research 40(1):71-75 (with N. Shashar, R. Hagan* and R.T. Hanlon).

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Areas of specialization: Developmental biology, evolution & development.

Research Interests: Development of the turtle shell; neural crest; bone formation.

<u>Techniques/Procedures Commonly Used</u>: Microscopy, immunohistochemistry, organ and tissue culture, in situ hybridization, polymerase chain reaction (PCR) analysis, molecular biology.

<u>Courses taught:</u> General Biology, Cell Biology, Seminar in Stem Cells & Human Cloning, Developmental Biology.

Recent publications: (*student)

- 2009. Reptilian heart development and the molecular basis of cardiac chamber evolution. Nature 461, 95-98 (with K. Koshiba-Takeuchi, et al)
- 2008. "How the turtle gets its shell", in Wyneken, J., Godfrey, M.H., and Bels, V. (editors). *Biology of Turtles*. *CRC* Press, Boca Raton (with S.F. Gilbert and A.C. Burke).
- 2007. A late-emerging population of trunk neural crest cells forms the plastron in the turtle *Trachemys scripta*, Evolution & Development 9, 267-277 (with E. Betters*, M. Yin, C Plafkin*, K McDow*, and S.F Gilbert).
- 2007. The contribution of neural crest cells to the nuchal bone and plastron of the turtle shell, *Integrative & Comparative Biology* 47, 401-408 (with S.F. Gilbert, G. Bender*, E. Betters*, and M.Yin).
- 2005. How the turtle forms its shell: a paracrine hypothesis of carapace formation. J. Exp. Zool. (Mol Dev Evol) 304B, 558-569 (with F. Tan*, S. Sistle*, E. Estes, G. Bender*, C. Kim*, P. Riccio* and S. Gilbert).
- 2004. Epithelial *Bmpr1a* regulates differentiation and proliferation in postnatal hair follicles and is essential for tooth development, Development 131, 2257-2268 (with T. Andl, K. Ahn, A. Kairo, E. Chu, L. Wine-Lee, S. Reddy, N. Croft, D. Metzger, P. Chambon, K. Lyons, Y. Mishina, J. seykora, E. Crenshaw, and S. Millar).
- 2003. *T-box* gene products are required for mesenchymal induction of epithelial branching in the embryonic mouse lung, Developmental Dynamics 226:82-90 (with J. Brommer*, R. Gardiner*, H. Sheipe* and S. Gilbert).

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Areas of Specialization: Physiology, endocrinology, nanotechnology

Research Interests: Contraception & infertility, nanotechnology biosensors, and International Science Education

<u>Techniques/Procedures Commonly Used</u>: Enzymology, pharmacology, small animal surgery, tissue culture, videomicrography, radioimmunoassay, histology, *in vitro* fertilization, and fluorescence microscopy.

<u>Courses Taught:</u> Human Anatomy and Physiology, Endocrinology, Histology, Pharmacology, Human Biology, Functional Human Anatomy, General Biology

Recent Publications:

2005. Nanowire Optical Sensor for Rapid Medical Diagnostics Innoventure, 2005: Pennsylvania State University, Hershey Medical Center. (with Habib, Y.M., Eklund, P.C., and Rickard, L.H.).

2002. The effects of oxytocin and arginine vasopressin *in vitro* on epididymal contractility in the rat. International Journal of Andrology 25:65-71 (with P.W. Studdard and J.L. Stein).

2001. Natural products for the treatment of tropical diseases. Trends in Parasitology, 17:2:58-60. (with Willcox, M.L., Pink, R. Wayling, Bodeck, S. and G.).

1998. Pharmacological developments in male contraception. Exp Opin Invest Drugs 6:1-19. (with S.A. Matlin).

1995. The contraceptive effects of etoprine on male mice and rats. J. Androl 16 (2):169-174. (with N.S. Malik, S.A. Matlin, J. Fried, and R.E.Pakyz).

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Areas of Specialization: Ichthyology; Systematics: Vertebrate Anatomy and Evolution.

<u>Research Interests</u>: Systematics of fish; Chondrichthyan biology and evolution; use of freshwater fish to monitor stream quality; sexuality and gender

Courses Taught: Zoology, Ichthyology, and Human Sexuality.

Recent Publications:

2012. Didier, D.A., Kemper, J.M., & Ebert, D.A. Phylogeny, biology, and classification of extant Holocephalans. *In*: Carrier, J.C., J.A. Musick, & M.R. Heithaus (Eds.), The Biology of Sharks and their Relatives, second edition. *CRC* Press, Boca Raton, pp. 97-121.

2010. Kemper, J.M., Ebert, D.A., D.A. Didier, and Compagno, L.J.V. Description of a new species of chimaerid, Chimaera Bahamaensis, from the Bahamas (Holocephali: Chimaeridae). Bull Mar. Sci. 86(3): 649-659.

2009. James, Kelsey C., D.A. Ebert, D. J. Long, & D. A. Didier. 2009. A new species of chimaeroid, Hydrolagus melanophasma sp. nov. (Chondrichthyes: Chimaeriformes: Chimaeridae) from the eastern North Pacific. Zootaxa 2218: 59-68.

2008. Didier, D.A. Two new species of the genus *Hydrolagus G*ill (Holocephali: Chimaeridae) from Australia, pp. 349 - 356. *In*: P.R. Last, W.T. White & J.J. Pogonoski (eds). Descriptions of New Australian Chondrichthyans. CSIRO Marine & Atmospheric Research Paper 022, 358 pp.

2008. Didier, D.A., Last, P.R. & White, W.T. Three new specis of the genus *Chimaera* Linnaeus (Chimaeriformes: Chimaeridae) from Australia, pp. 327 – 339. *In*: P.R. Last, W.T. White & J.J. Pogonoski (eds). Descriptions of New Australian Chondrichthyans. CSIRO Marine & Atmospheric Research Paper 022, 358 pp.

2006. Quaranta, K.L, D. A. Didier, D. J. Long, and D. A. Ebert. A new species of chimaeroid, *Hydrolagus alphus* sp. nov. (Chimaeriformes: Chimaeridae) from the Galapagos Islands. Zootaxa 1377: 33-45.

- 2006. Barnett, A.K., D.A. Didier, D.J. Long, and D.A. Ebert. *Hydrolagus mccoskeri* sp. nov., a new species of chimaeroid fish from the Galápagos Islands (Holocephali: Chimaeriformes: Chimaeridae). Zootaxa 1328: 27-38.
- 2002. Didier, D.A. and B. Séret. 2002. Chimaeroid fishes of New Caledonia with description of a new species of *Hydrolagus* (Chondrichthyes, Holocephali). Cybium 26:225-233.
- 2002. Didier, D.A. 2002. Two new species of chimaeroid fishes from the southwestern Pacific Ocean (Holocephali, Chimaeridae). Ichthyological Research 49:299-306.
- 2002. Didier, D.A. Chimaeras. *In*: The living marine resources of the Western Central Atlantic. Volume 1: Introduction, mollusks, crustaceans, hagfishes, sharks, batoid fishes, and chimaeras. FAO Species Identification Guide for Fishery Purposes and American Society of Ichthyologists and Herpetologists Special Publication No. 5. Rome, FAO, pp. 592-599.

Dr. AARON M. HAINES

B.S. in Forestry and Wildlife Management, Virginia Tech; M.S. in Wildlife & Range Management, Texas A&M University-Kingsville (2003); Ph.D. in Wildlife Science, Texas A&M University-Kingsville (2006).

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Areas of Specialization: Conservation Biology & Wildlife Ecology

<u>Research Interests</u>: Identifying approaches to implement on the ground conservation strategies to benefit species of conservation concern. Conservation strategies may include the use of spatial models to identify priority areas in need of protection, mitigation of poaching activity, evaluation of field techniques for conservation research, and evaluation of recovery efforts for threatened and endangered species.

<u>Techniques/Procedures Commonly Used</u>: Geographical Information Systems Analysis, Satellite Telemetry, Remote Trail Cameras.

<u>Courses Taught</u>: General Biology, Concepts of Zoology, Conservation Biology, Ornithology and Mammalogy.

Recent Publications:

- 2012. Spatially-explicit analysis of poaching activity as a conservation management tool. Wildlife Society Bulletin. (with D. Elledge, et al)
- 2012. By the numbers: How is recovery defined by the U.S. Endangered Species Act? BioScience 62: 646-657. (with M.C. Neel)
- 2012. Incorporating Wildlife Conservation into County Comprehensive Plans: GIS Approach. Northwest Science 86: 53-70. (with M. Leu et al)
- 2010. Comparing mammal capture effectiveness between scent stations and remote cameras in forest and prairie habitat. The Journal of the Iowa Academy of Science 117: 4-8. (M. McKinney)
- 2010. Conservation reliant species: and the future of conservation. Conservation Letters 3:71-78. (with J. M. Scott, et al)
- 2009. Habitat partitioning of sympatric ocelots and bobcats: implications for recovery of ocelots in southern Texas. Southwestern Naturalist 54:119-126. (with J. Horne, et al)
- 2009. Nest niche partitioning of Lewis's and Red-headed woodpeckers in burned pine forests. The Wilson Journal of Ornithology 121:89-96. (with K.T. Vierling and D.J. Gentry)

DR. CHRISTOPHER R. HARDY

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Areas of Specialization: Plant Systematics, Evolution, Biodiversity Informatics, Floral Anatomy &

Development, GIS Modeling of Species Distributions, Natural History Education.

<u>Research Interests:</u> Floristics, Taxonomic Study, Phylogeny Reconstruction, Biodiversity Web Development, GIS & Biogeography.

Phone: 717-871-4317

<u>Techniques/Procedures Commonly Used:</u> PCR, DNA-sequencing, Scanning Electron Microscopy, Histology, Observations of Plants *in situ*, GIS.

Courses Taught: Foundations of Biology, Concepts of Botany, Plant Systematics.

Recent Publications:

2012. Algae in forensics investigations. Pp. 145-173 (Chapter 9) in D. W. Hall, J. H. Byrd (eds.) Forensic Botany: A Practical Guide. John Wiley & Sons, Ltd., London. (With J.R. Wallace.).

2011. Plants and wildlife forensics. Pp. 145-160 (Chapter 9) in J.E. Huffman, J.R. Wallace (eds.) Wildlife Forensics: Methods and Applications. Wiley-Blackwell Publishing, London. (With D.S. Martin.)

2010. A generic classification of the Restonieae (Restionaceae), southern Africa. *Bothalia* 40: 1-35. (With H.P. Linder.)

2009. Floral organogenesis and the developmental basis for pollinator deception in the Asiatic Dayflower, *Commelina communis* (Commelinaceae). *American Journal of Botany* 96: 1236-1244. (With L. Sloat and R.B. Faden.)

2008. Simple biodiversity mashups for non-tech-savvy biologists: a demonstration using the liana flora of Pennsylvania, USA. *Journal of the Torrey Botanical Society* 135: 585-594. (With N.W. Hardy.)

2007. Phylogeny and historical ecology in *Rhodocoma* (Restionaceae) from the Cape Floristic Region. *Aliso* 23: 213-226. (With H.P. Linder.)

2006. Are mitochondrial genes useful for the analysis of monocot relationships? *Taxon* 55: 857-870. (With J.I. Davis, G. Petersen, O. Seberg, D.W. Stevenson, M.P. Simmons, F.A. Michelangeli, D.H. Goldman, L.M. Campbell, C.D. Specht, J.I. Cohen.)

2006. Reconstructing ancestral ecologies: Challenges and possible solutions. *Diversity & Distributions* 12: 7-19.

2005. Speciation in the Cape flora: A macroevolutionary and macroecological perspective. Pp. 46-73 in F. T. Bakker, L. W. Chatrou, B. Gravendeel and P. B. Pelser, eds. *Plant species-level* systematics: *New perspectives on pattern & process*. Koeltz, Königstein. (With H.P. Linder.)

2004. *Plowmanianthus*, a new genus of Commelinaceae with five new species from tropical America. *Systematic Botany* 29 (2): 316-333. (With R.B. Faden.)

2004. Evolution of the species-rich Cape flora. *Philosophical Transactions of the Royal Society of London, B:* 1623-1632. (With H.P. Linder.)

DR. CAROL ELY HEPFER

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Areas of Specialization: Genetics, cell and molecular biology.

<u>Research Interests</u>: Regulation of eukaryotic gene expression, yeast genetics and recombinational mechanisms, and molecular basis of sex determination in cephalopods.

<u>Techniques/Procedures Commonly Used</u>: Gene cloning and mapping, polymerase chain reaction, *in vitro* mutagenesis, electrophoresis, nucleic acid hybridization, DNA sequence analysis, microbial and molecular methodologies.

<u>Courses Taught</u>: Genetics, Human Genetics: Applications and Analysis, General Biology, Senior Seminar. Recent Publications:

- 2012. Identification of Sex-Specific Genetic Sequences in the Squid *Doryteuthis pealed*. <u>Pennsylvania Academy of Sciences Annual Meeting</u> (with P. Behmer and D. Farnell), 2012.
- 2008. Effectiveness of Single Strand Conformation Polymorphism Analysis and Enzymatic Mismatch Cleavage for Mutation Detection in a Family with Complete AndrogenInsensitivity. <u>Journal of the Pennsylvania</u> Academy of Sciences 81:134 (with S. Rice).
- 2005. DEG1 encoding the tRNA: pseudouridine synthase Pus3p, impacts HOT1-stimulated recombination in *Saccharomyces cerevisiae*. Molecular Genetics and Genomics. (with H. Fogell, K.G. Steudel, S. Arnold-Croop, M. Moon, A. Roff, S. Zaikoski, A. Rickman, K. Komisisky, D.L. Harbaugh, G.I. Lang, and R.L. Keil).
- 1999. Effects of *DEG1* mutations on *HOT1*-dependent genetic recombination in Saccharomyces cerevisiae do not result solely from changes in transcription. Molecular Biology of the Cell 10(sup):93a. (with H. Fogell, R. Prusty, S. DiBartolomeis, and R. Keil).

DR. JOHN E. HOOVER, Department Chair

B.S., Indiana University of Pennsylvania; Ph.D., State University of New York Health Science Center at Syracuse.

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Areas of Specialization: Neuroscience, physiology.

Research Interests: Neural control of movement, sensorimotor integration.

<u>Techniques/Procedures Commonly Used</u>: Neurosurgery, microstimulation, neuroanatomic tracing, electrophysiological recording, histology, microscopy.

<u>Courses Taught</u>: General Biology, Concepts of Zoology, Human Anatomy and Physiology, Neurobiology, Functional Human Anatomy.

Recent Publications:

- 2010. An unbiased stereological estimate of the number of motor neurons in the cervical enlargement of the rat spinal cord. Journal of the Pennsylvania Academy of Science 84(1):26-30 (with R.R. Ritzel)
- 2003. Sensorimotor corticocortical projections from rat barrel cortex have an anisotropic organization that facilitates integration of inputs from whiskers in the same row. Journal of Comparative Neurology, 466:525-544. (with Z.S. Hoffer).
- 2003. Quantitative comparisons of the topographic organization in the ventrobasal complex and posterior nucleus of the rodent thalamus. Brain Research, 96:54-68. (with K.D. Alloway).
- 2003. Projections from primary somatosensory cortex to the neostriatum: the role of somatopic continuity in corticostriatal convergence. Journal of Neurophysiology, 89:1576–1587. (with K.D. Alloway).
- 2000. Overlapping corticostriatal projections from the rodent vibrissal representations in primary and secondary somatosensory cortex. Journal of Comparative Neurology, 426(1):51-67. (with K.D. Alloway, J.J. Mutic and Z. Hoffer).

Dr. BRENT M. HORTON

B.S., Colorado State University; Ph.D., University of Maine

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<u>Areas of Specialization</u>: Animal behavior, behavioral ecology, ecological physiology, behavioral endocrinology/neuroendocrinology, ornithology.

<u>Research Interests</u>: The neuroendocrine and genetic bases of social and reproductive behavior in birds. Using integrative approaches on natural models (wild animals) to understand the proximate and ultimate mechanisms underlying behavioral strategies and life history variation.

<u>Techniques/Procedures Commonly Used</u>: Hormone analyses; RNA and DNA extraction, preservation, and analysis; standard and quantitative (qRT) PCR; brain histology; *in situ* hybridization; diverse field techniques for study of physiology and behavior of wild birds.

<u>Courses Taught</u>: Foundations of Biology, Concepts of Zoology, Animal Physiology, Behavioral Ecology. Recent Publications:

- 2014. New insights into the hormonal and behavioural correlates of polymorphism in white-throated sparrows, Zonotrichia albicollis. Animal Behaviour 93: 207-219 (with I.T. Moore & D.L. Maney)
- 2014. Promoter polymorphism and differential expression of estrogen receptor α in a species with alternative behavioral phenotypes. Proceedings of the National Academy of Sciences, 11: 1443-1448. (with W.H. Hudson, E.A. Ortland, S. Shirk, J.W. Thomas, E.R. Young, W. Zinzow-Kramer, & D.L. Maney).
- 2014. Evaluation of reference genes for quantitative real-time PCR in songbird brain, pituitary, and gonad. Hormones and Behavior, 66: 267-275. (with W.M. Zinzow-Kramer & D.L. Maney).
- 2014. Hormonal regulation of vasotocin receptor mRNA in a seasonally breeding songbird. Hormones & Behavior 65: 254-263. (with A.V. Grozhik, C.P. Horoszko, Y. Hu, D.A. Voisin and D. L. Maney).
- 2013. Behavioral characterization of a white-throated sparrow homozygous for the ZAL2m chromosomal rearrangement. Behavior Genetics, 43(1): 60-70. (with Y. Hu, C.L. Martin, B.P. Bunke, E.S. Matthews, I.T. Moore, J. W. Thomas and D.L. Maney).
- 2013. Divergent selection on bills contributes to non-random mating between swamp sparrow subspecies. Animal Behaviour, 86: 467-473. (with B. Ballentine, E.T. Brown & R. Greenberg).
- 2012. Morph matters: Aggression bias in a polymorphic sparrow. PLoS ONE, 7(10): e48705. (with M.E. Hauber and D.L. Maney).
- 2012. Proximity data-loggers increase the quantity and quality of social network data. Biology Letters, 8: 917-920. (with T.B. Ryder, M. van den Tillaart, J. Morales and I.T. Moore).
- 2012. High levels of relatedness between brown-headed cowbird nestmates in a heavily-parasitized host community. The Auk, 129(4): 623-631. (with J.W. Rivers, S. Young, E. Gonzalez, J. Lock & R.C. Fleischer).
- 2011. Understanding testosterone variation in a tropical lek-breeding bird. Biology Letters, 7(4): 506–509. (with T.B. Ryder, and I.T. Moore).
- 2011. Movements and survival of black-footed ferrets associated with an experimental translocation in South Dakota. Journal of Mammalogy, 92(4): 742-750. (with D.E. Biggins, J.L. Godbey & T.M. Livieri).
- 2010. Variation in baseline corticosterone and the adrenocortical response in breeding white-throated sparrows. The Auk, 127(3): 540-548. (with R.L. Holberton).
- 2010. Seasonal and population variation in breeding testosterone in male orange-crowned warblers, Vermivora celata. General & Comparative Endocrinolgy, 168: 333-339. (with J. M. Yoon, C.K. Ghalambor, I.T. Moore, & T.S. Sillett).
- 2009. Corticosterone manipulations alter morph-specific nestling provisioning behavior in male white-throated Sparrows, Zonotrichia albicollis. Hormones & Behavior, 56: 510-518. (with R.L. Holberton).
- 2007. Intraperitoneal delivery of exogenous corticosterone via osmotic pump in a passerine bird. General & Comparative Endocrinology, 152: 8-13. (with J.A. Long & R.L. Holberton).

Dr. MAJA KLOSINSKA

M.S., University of Lodz, Poland; Ph.D., Princeton University

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Areas of Specialization: Genetics, Molecular Biology, Epigenetics, Plant Biology

Research Interests: Gene imprinting in plants, DNA methylation, abiotic stress, apomictic plants.

Courses Taught: Foundations of Biology, Special Topics (Epigenetics)

Recent Publications:

2016. Conserved imprinting associated with unique epigenetic signatures in the Arabidopsis genus. *Nat Plants* 2:16145 (with Picard C., Gehring M.)

- 2011. Yeast cells can access distinct quiescent states. *Genes Dev.* **25**, 336-49 (with Crutchfield C., Bradley P., Rabinowitz J., Broach J.)
- 2004. Triple-stranded DNA and its applications. (review) *Postepy Biologii Komorki* 31, 647-661 (with Blasiak J.)

DR. TIMOTHY I. LADD

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Areas of Specialization: Microbiology, microbial ecology, immunology, food microbiology.

<u>Research Interests</u>: Bacterial attachment to natural and man-made surfaces, heterotrophic activity of aquatic populations, biodegradation of labile and refractory compounds by microbial populations in streams and groundwater, antibiotic sensitivity measurement of attached bacteria.

<u>Techniques/Procedures Commonly Used</u>: Fluorescent microscopy, SEM, liquid scintillation counting, enzymology techniques, kinetic assays, radioisotope procedures.

<u>Courses Taught</u>: General Biology, Concepts of Botany, Microbiology, Human Biology, and Immunology. Recent Publications:

2001. A demonstration of nitrogen dynamics in OXIC and hypoxic soils and sediments. American Biology Teacher vol. 63(3) 199-205. (with J. Ambler, K. Polovitz, & G. Steucek)

1990. Methods for studying biofilm bacteria. Methods in Microbiology 22:285-307 (with J.W. Costerton)

1987. Bacterial biofilms in nature and disease. Ann. Rev. Micro. 41:435-506 (with J.W. Costerton, K.J. Cheng, G.G. Geesey, J.C. Nickel, & T. Marrie)

1987. The use of a radiorespiratometric assay for testing the antibiotic sensitivity of catheter-associated bacteria. J. Urology 138:1451-1456. (with D. Schmeil, J.C. Nickel, & J.W. Costerton)

DR. JOEL B. PIPERBERG

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Areas of Specialization: Cell, developmental, and molecular biology.

<u>Research Interests</u>: Molecular biology, control of gene expressions in development and morphogenesis; effect of various drugs on red blood cell membrane osmotic fragility.

<u>Techniques/Procedures Commonly Used</u>: Gel electrophoresis, column chromatography, tissue culture, spectrophotometry.

<u>Courses Taught</u>: General Biology (BIOL 100), Foundations of Biology (BIOL 101), Cell Biology, Developmental Biology, Molecular Biology, Molecular and Cellular Techniques, Human Biology, Human Sexuality, Frontiers in Biomolecular Science, Freshman Biology Honors Seminar (BIOL 108).

Recent Publications:

2013 Composition of Answers for the Essay-type Review Questions that appear at the end of each section of Gerald Karp's Cell and Molecular Biology: Concepts and Experiments, 7th ed. NY: John Wiley & Sons, Inc.

2013 Test Bank for Gerald Karp's Cell and Molecular Biology: Concepts and Experiments, 7th ed. NY: John Wiley & Sons, Inc.

2010. Instructor's Manual for Gerald Karp's Cell and Molecular Biology: Concepts and Experiments, 6th ed. NY: John Wiley & Sons, Inc.

2010. Test Bank for Gerald Karp's Cell and Molecular Biology: Concepts and Experiments, 6th ed. NY: John Wiley & Sons, Inc.

- 2008. Instructor's Manual for Gerald Karp's Cell and Molecular Biology: Concepts and Experiments, 5th ed. NY: John Wiley & Sons, Inc.
- 2008. Test Bank for Gerald Karp's Cell and Molecular Biology: Concepts and Experiments, 5th ed. NY: John Wiley & Sons, Inc.
- 2005. Instructor's Manual for Gerald Karp's Cell and Molecular Biology: Concepts and Experiments, 4th ed. NY: John Wiley & Sons, Inc.
- 2005. Test Bank for Gerald Karp's Cell and Molecular Biology: Concepts and Experiments, 4th ed. NY: John Wiley & Sons, Inc.
- 2003. Instructor's Manual for *BioInquiry:* Making Connections in Biology_(Learning System_1.0) by Pruitt, Underwood and Surver, 2nd ed., NY: John Wiley & Sons, Inc.
- 2002. Instructor's Manual for Gerald Karp's Cell and Molecular Biology: Concepts and Experiments, 3rd ed. NY: John Wiley & Sons, Inc.
- 2000. Instructor's Manual for *BioInquiry:* Making Connections in Biology_(Learning System_1.0) by Pruitt, Underwood and Surver. NY: John Wiley & Sons, Inc.
- 1999. Instructor's Manual for Gerald Karp's Cell and Molecular Biology: Concepts and Experiments, 2nd ed. NY: John Wiley & Sons, Inc.
- 1996. Instructor's Manual for Gerald Karp's Cell and Molecular Biology. NY: John Wiley & Sons, Inc.
- 1994. Comparison of the glucocorticoid receptors from retina and liver of the embryonic chick, Journal of the Pennsylvania Academy of Science 68(3):107-116 (with R. Ford, B. Archilla, K. Doolan and L. Remington).
- 1993. An introduction to DNA fingerprinting. American Biology Teacher 55:216-221 (with C. Hepfer and G. Farganis).

DR. CHRISTOPHER R STIEHA

B.A. Chemistry, B.S. Biology, University of Kentucky; M.S. Biology, University of Kentucky; Ph.D. Biology, University of Kentucky

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<u>Areas of Specialization</u>: Plant Ecology, Plant-Herbivore Interactions, Quantitative Ecology, Statistics <u>Research Interests</u>: plant-herbivore interactions and the potential to use plant defenses to control pests in agricultural systems; competition between male and female plants and the loss of one sex <u>Courses Taught</u>: General Biology, Concept of Botany Lab, Population and Community Ecology Recent Publications:

- 2017. Maintenance of the sexes and persistence of a clonal organism in spatially complex metapopulations. Evolutionary Ecology. 31:363-386. (with R., García-Ramos, G., McLetchie, D.N., and Crowley, P.
- 2017. Current challenges in the modeling of population cycles. Ecology Letters. 20(8): 1074-1092 (with Barraquand, F., Louca, S., Abbott, K.C., Cobbold, C.A., Cordoleani, F., DeAngelis, D.L., Elderd, B.D., Fox, J.W., Greenwood, P., Hilker, F.M., Lutscher, F., Dennis Murray, D., Taylor, R.A., Vitense, K., Wolkowicz, G., and Tyson, R.C.)
- 2016. The Effects of Plant Compensatory Regrowth and Induced Resistance on Herbivore Population Dynamics. American Naturalist. 187(2): 167-181 (with Abbott, K, and Poveda, K.)
- 2016. A Comparison of Seed Predation, Seed Dispersal, and Seedling Herbivory in Oak and Hickory: Species with Contrasting Regenerating Abilities in a Bluegrass Savanna-Woodland Habitat. Northeastern Naturalist. 23(4): 466-481. (with Cilles, S., Coy, G., Cox, J., Crowley, P.H., Maehr, D.)
- 2016. QPot: An R package for stochastic differential equation quasi-potential analysis. The R Journal. 8(2): 19-38. (with Moore, C.M., Nolting, B.C., Cameron, M.K., and Abbott, K.C.)
- 2015. Tolerance responses to herbivory: implications for future management strategies in potato. Annals of Applied Biology. 166: 208-217. (with Poveda, K.)
- 2014. A Field Guide To Programming: A Tutorial for Learning Programming and Population Models. CODEE Journal. URL: http://www.codee.org/ref/CJ14-0876 (with Montovan, K, and Castillo-Guajardo, D.)
- 2014. The dispersal process of asexual offspring and the contribution to population persistence. American Journal of Botany. 101(2): 348-56. (with Middleton, A., Stieha, J., Trott, S., and McLetchie, D.N.)

DR. RYAN WAGNER

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<u>Areas of Specialization</u>: Plant physiology, Molecular Biology, Biochemistry and Plant-Insect Interactions <u>Courses Taught</u>: General Biology, Plant Physiology, Plant Biochemistry, Concepts of Botany, Plants and

People, Foundations in Biology.

Recent Publications:

2004. Protein phosphorylation is suppressed when wheat embryos are hydrated and remain growth arrested. See Science Research, 14: 287-296. (with M.K. Walker-Simmons).

2002. The ABA-responsive kinase PKABA1 interacts with a seed-specific ABA response element binding factor, TaABF, and phosphorylates TaABF peptide sequences. Plant Physiology, 130: 837-846. (with 5.D. Verhey, R. Johnson, and M.K. Walker-Simmons).

DR. JOHN R. WALLACE, D-ABFE

B.S., Pennsylvania State University; M.S., Shippensburg University; Ph.D., Michigan State University

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<u>Areas of Specialization</u>: Medical entomology, aquatic entomology, forensic entomology, and stream restoration ecology.

Research Interests: Medical Entomology - Mosquito Ecology (larval feeding and adult overwintering), Ecology of Buruli/Bairnsdale Ulcer; Black fly Surveillance and Control, Forensic Entomology and Carrion Ecology in Aquatic systems; Stormwater management and Mosquito Population Biology and Arbovirus Surveillance; Stream Ecology - Crayfish ecology of Lancaster County; Sediment Effects on Macroinvertebrate Community Structure.

<u>Techniques/Procedures Commonly Used</u>: Light and epifluorescent microscopy, chlorophyll pigment analyses, microdissection, photomicrography, immunoassay techniques and a variety of molecular techniques.

<u>Courses Taught</u>: Entomology, Aquatic Entomology, Aquatic Biology, Ecology & Evolution, Seminars in Forensic Entomology and Invasion Ecology, Perspectives of Environmental Awareness, General Biology. Recent Publications:

- 2012. Algae in Forensic Investigations. In: Forensic Botany: A Practical Guide. (D. Hall and J. Byrd, eds.). Wiley-Blackwell Publishing. IN PRESS. (with C.R. Hardy)
- 2012. Wildlife Forensics: Techniques and Applications. Wiley Publishing, London, UK. 370pp. (with J. E. Huffman)
- 2012. History of Wildlife Forensics, In: Wildlife Forensics: Techniques and Applications (J.E. Huffman and J.R. Wallace, eds.). Wiley Publishing, London, UK pp 35–50. (with J. C. Ross)
- 2011. A Criminal 'Case' to be made with Caddisflies In: (J. Li, editor), Wading for Bugs: Discovering Stream-Invertebrates with the Experts, Oregon State University Press, Corvalis, OR. Pp 61-64. (with R. W. Merritt)
- 2011. Conservation and Management of Crayfishes: Lessons from Pennsylvania. Fisheries, 36(10): Pp 489 507. (D.A. Lieb, et al)
- 2010. Ulcer Diseases: A systematic review of ecology and transmission. PLoS Negl Trop Dis 4(12): e911.doi:10.1371/journal.pntd.0000911. (with R.W. Merritt, et al)
- 2010. Interaction of *Mycobacterium ulcerans* with mosquito species: implications for transmission and trophic relationships. Appl. Environ. Microb, Vol 26(18):6215-6222. (with M.C. Gordon, et al)
- 2010. Environmental testing during an outbreak of Buruli ulcer in Victoria, Australia, suggests a role for mammals in the ecology of *Mycobacterium ulcerans*. PLoS Negl Trop Dis 4(8):e791.
 Doi:10.1371/journal.pntd.0000791. (with J.A.M. Fyfe, et al)
- 2009. Discovery of promoters involved in mycolactone gene expression and their application to studies of the pathogenesis and ecology of Mycobacterium ulcerans PLoS Negl Trop Dis 3(11):e553. Dol:10.137/journal.pntd.0000553 (with N.K. Tobias, et al)

- 2009. Forensic Meteorology: The application of weather and climate to forensic entomology. In: Utility of Arthropods in Legal Investigations (J. Byrd,ed.), CRC Press, Boca Raton, FL. Pp. 519 538. (with J. R. Scala)
- 2009. Persistent association of *Mycobacterium ulcerans* with West African predacious insects of the family Belostomatidae. *Applied and Environmental Microbiology*, p. 7036 6042 (with L.H. Mosi, et al)
- 2009. Biting Diptera of Freshwaters. In: The encyclopedia of Inland Waters. (G.Lykens, editor). Elsevier Publishers, London, UK pp. 280-287
- 2008. Estimating a postmortem submersion interval using algal diversity on mammalian carcasses inbrackish marshes. Journal of Forensic Science. 53(4): 935 941 (with MU'06 K. Zimmerman)
- 2008. Caddisfly cases assist homicide case: Determining a postmortem submersion interval (PMSI) using aquatic insects. Journal of Forensic Science, Vol. 53 (1): 1-3. (with R.W. Merritt, et al)
- 2008. Evaluation of VNTR typing for the identification of *Mycobacterium ulcerans* in enviornmental samples from Victoria, Australia. *FEMS Microbiology Letters:* 1-18 (with C.J. Lavender, et al)
- 2008. Culicidae. In: An introduction to aquatic insects in North America (R.W. Merritt, K.W. Cummins and M. Berg, editors). Kendall Hunt Publishers, Dubusque, IA. Pp 801-823. (with E.W. Walker).
- 2008. The use of aquatic insect evidence in criminal investigations. In: Entomology and Death, 2nd Edition, (N. Haskell and R. Williams, eds.), Joyce Publishing, North Carolina pp. 114 130. (with R.W. Merritt)
- 2007. Forensic Entomology. In: Forensic Investigation: Inside the Yellow Tape (L. Farr ed.). Hayen-McNeil Publishing, Plymouth, MI. Pp. 301-327. (with J. Tomberlin and J. Byrd).
- 2007. Stormwater management and mosquito ecology: A systems-based approach towards an integrative management strategy. Journal of Stormwater Management, Vol.8 (2):20-46.
- 2006. Forensic Entomology: Myths Busted. Forensic Magazine, Vol. 3(5): 10-14. (with J. Tomberlin and J. Byrd).
- 2005. Effects of Bacillus sphaericus (VectoLex®) on Nontarget Organisms in a Mosquito Control Program in southeastern Wisconsin: A Three-Year Study. J. Amer. Mosq. Contr. Assoc. 21: 201-212. (with R.W. Merritt, et al)
- 2004. Forensic Entomology: Proper Crime Scene Collection, Preservation, and Shipment of Entomological Evidence. http://insects.tamu.edu/extension/publications/epubs/eee_0000 4.html Texas Cooperative Extension Bulletin:1-7. (with J.K. Tomberlin, J.Olson)
- 2004. Forensic Entomology: History and Application of Entomology in Forensic Investigations http://insects.tamu.edu/extension/publications/epubs/eee_00003.html Texas Cooperative Extension Bulletin:1-4. (with J.K. Tomberlin, J. Olson)
- 2004. Diel feeding periodicity of larval anopheline mosquitoes on microorganisms and microinvertebrates: a spatial and temporal comparison of Anopheles quadrimaculatus (Say) (Diptera: Culicidae) diets in a Michigan pond. J. Med.Entomol.,41: 853-860. (with R.W. Merritt)
- 2004. Aquatic entomology and flyfishing. In: Encyclopedia of Entomology Vol. 1 pp. 177-179. (J.L. Capinera, ed.). Kluwar Academic Publishers, The Netherlands. 815 pp. (with F.D.L. Rinkevich [MU '02])
- 2004. Pig decomposition in lotic aquatic systems: the potential use of algal growth in establishing a postmortem submersion interval (PMSI). *Journal of Forensic Science*, 49(2):330-336. (J. Haefner [MU '04] and R.W. Merritt)
- 2002. A preliminary characterization of the physiological ecology of overwintering *Anopheles* mosquitoes in Midwestern USA. *Journal of the American Mosquito Control Association*, 18(2): 126-127. (with P.R. Grimstad)
- 1999. Influence of microclimate, food, and predation on *Anopheles quadrimaculatus* (Diptera: Culicidae) growth and developmental rates, survivorship, and adult size in a Michigan pond. *Journal of Environmental Entomology*, 32(2): 233-239. (with R.W. Merritt)

DR. LAVERN R. WHISENTON-DAVIDSON

B.S., Morningside College; M.S. and Ph.D., University of Notre Dame.

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<u>Areas of Specialization</u>: Insect biochemistry, endocrinology and neuroendocrinology.

- <u>Research Interests</u>: Hormonal interactions responsible for molting and metamorphosis in insects, isolation and purification of neuropeptides involved in post-embryonic development and reproduction in mosquitoes.
- <u>Techniques/Procedures Commonly Used</u>: Microsurgery, microdissection, light and fluorescent microscopy, HPLC, column chromatography and other protein purification techniques, radioimmunoassays, immunocytology, SEM and TEM.
- <u>Courses Taught</u>: General Biology, Human Anatomy and Physiology, Endocrinology, Comparative Anatomy, Nutrition.

Recent Publications:

- 1997. Life cycle expression of a bombyxin-like neuropeptide in the tobacco hornworm, *Manduca sexta*. J. Insect Physiol. 43(1):47-53. (with B.V. Nogueira, D.P. Muehleisen, R.S. Gray and W. E. Bollenbacher)
- 1992. Steroidogenic activity in prothoracic gland cells of retrocerebral complexes of fourth instar mosquitoes. American Society Of Zoologists 31(5):87. (with D. Sonnen)
- 1989. Ecdysteroid titres during pupal-adult development in *Aedes aegypti*: Basic for a sexual dimorphism in the rate of development. J. Insect Physiol. 35(1):67-73.
- 1987. Isolation and partial purification of gonadotrophic factors in heads of pupal and adult *Aedes aegypti*. Mol. Cell. Endocrinol. 50:3-14. (with T. Kelly & W. Bollenbacher)
- 1987. Regulation of juvenile hormone biosynthesis by 20-hydroxyecdysone during the fourth larval instar of the tobacco hornworm, *Manduca sexta*. Gen. Comp._Endocrinol. 66:62-70. (with R. Watson, N. Granger, & W. Bollenbacher)

DR. DANIEL H. YOCOM

B.S., Lebanon Valley College; M.S., University of Pittsburgh; Ph.D., State University of New York (SUNY) at Stony Brook

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Areas of Specialization: Microbiology, mycology, population biology.

<u>Research Interests</u>: Ecology and evolution of symbiotic relationships, such as mycorrhizae and diseases; role of mycorrhizae in higher plant succession; effect of mycorrhizae on host plant growth and reproduction; role of mycorrhizae in agricultural systems

<u>Techniques/Procedures Commonly Used</u>: Factorial experimental design and analysis, culturing of bacteria and fungi, aseptic techniques, staining and quantification of plant roots.

<u>Courses Taught</u>: General Biology, Concepts of Botany, Microbiology, Environmental Science, Ecology, Applied Ecology, Biodiversity, Mycology, Plant Ecology.

Recent Publications:

- 2000. The impact of habitat fragmentation on arthropod biological diversity. American Biology Teacher 62:414-420. (with M. Kishbaugh)
- 1994. The fungi of Southcentral Pennsylvania: A first look. *In* Zegers, D., ed. At the Crossroads: A Natural History of Southcentral Pennsylvania.
- 1994. Are crop and weed interaction affected by mycorrhizae? J. Pa. Acad. Sci. 67:175. (with D.D. Drenner)
- 1994. Effects of mycorrhizae on competition between soybeans and weeds. J. Pa. Acad. Sci. 67:181. (with H. Hudock)
- 1993. Dependence of three Nebraska sandhills warm-season grasses on vesicular-arbuscular mycorrhizae. J. of Range Mgmt. 46:14–20. (with J.J. Brejda, L.E. Moser and S.S. Waller)
- 1991. Effect of mycorrhizae and nutrient exchange on the growth of interacting corn and bean plants. Bull. Ecol. Soc. Amer. 72(2):297-298. (with D. Weaver)

Additional General Education Requirements

Foundations for Lifelong Learning (4 courses minimum 12 credit hours)

This category requires: 1. ENGL 110, 2. COMM 100, 3. GenEd (G2) approved Mathematics course (MATH 1XX), and 4. Advanced Writing (AW) course (ENGL 311, 312, 313, or 316).

Guidelines:

- ENGL 110 must be completed with a grade of C- or better.
- COMM 100 must be completed with a grade of C- or better.
- The upper level writing (AW) course has a prerequisite of ENGL 110 (C- or better) and a minimum of 60 credit hours completed. Many majors recommend or require a specific AW course. Check the catalog for further details.
- G2 Math course must be different from that used towards the G2 block in the Liberal Arts Core.

Subject/Course#	Course Title	Cr. Hrs.	<u>Grade</u>
1. ENGL 110 2. COMM 100	English Composition Fundamentals of Speech	3.0	
3. <u>MATH</u> 4. ENGL			

Connections & Exploration Courses (minimum 9 credit hours)

Guidelines/Prerequisites:

- 1. First-Year Inquiry (FYI) Seminar UNIV 103 (3 credit hours) or Open Elective (3 credit hours)
 - Open electives must be 100 level or above and must be taken outside of primary major.
 - For BSE students, required professional education courses cannot count as open electives.
- 2. Perspectives (P) Course (3 credit hours)
 - May be satisfied with approved courses from the major, the minor, the required related area, or general electives.
 - ENGL 110 and COMM 100 completed with grades of C- or better.
 - Minimum of 60 credit hours completed.
- 3. Wellness/Health Education course (3 credit hours)
 - Any WELL 175 course will fulfill this requirement.
 - Early Childhood Education or Early Childhood/Special Education majors are required to take WELL 240.

Subject/Course#	Course Title	Cr. Hrs.	<u>Grade</u>
1.			<u>.</u>
2.			
3.			

Cultural Diversity & Community (D) Course

- May be satisfied with approved courses from the GenEd requirements (including Perspectives), the major, the minor, the required related area, or general electives.

Subject/Course#	Course Title	<u>Cr. Hrs.</u>	<u>Grade</u>
1			

Writing Intensive (W) Courses (3 courses)

Guidelines/Prerequisites:

- May be satisfied with approved courses from the GenEd requirements, the major, the minor, the required related area, or general electives.
- ENGL 110 must be completed with a grade of C- or better.

Subject/Course#	Course Title	Cr. Hrs.	<u>Grade</u>
1			
2.	Market and the second s		
3			

Developmental Courses (COMM 010, EDUC 090, ENGL 010, MATH 090)

These do not count toward the 120 credit hours required for graduation.

Effective Fall Semester, 2012

MILLERSVILLE UNIVERSITY

General Education Curriculum Guide (Purple Sheet)

Student Name:	Student I.D. #					
Critical Thinking Across the Liberal Arts (G1-G3)						
- Courses must b - At least three co - Up to six "Requ		partments within eacks G1, G2 &/or Coe counted toward	ach G1, G2 33 must be a GenEd rec	at the 200 level or above.		
G1. Humanities and Fine Select courses from Music or Philosophy department in this b	Art, Communications & Tly. Students majoring in a Hu	neatre, English, Fo	reign Lang	Ocredit hours. Guage (which includes HUMN courses), ment may not count courses from the major		
Subject/Course#	Course Title	Cr. Hrs.	<u>Grade</u>			
3. G2. Science and Mathem Select courses from majoring in a Science Additional Guideli - At least two courthis can be two	: Biology, Chemistry, Comp ce or Mathematics departme nes: urses must be taken from the	nimum totaling outer Science, Eart nt may not count e "natural sciences ese departments C	h Sciences, courses from ": Biology,	, Mathematics, Nursing or Physics. Students m the major department in this block. , Chemistry, Earth Sciences and Physics. rese from any two of these departments.		
Subject/Course#	Course Title	Cr. Hrs.	<u>Grade</u>	<u>✓ 2 from</u> <u>✓ 1 Lab</u> Natural Sci. <u>Course</u>		
1. 2. 3.						
Government, Histor Social Work/Geron	: African-American Studies, y, International Studies, Oc	, Anthropology, B cupational Safety	usiness Adı & Environı	nrs. ministration, Economics, Geography, mental Health, Psychology, Sociology, cial Sciences areas may not count courses		
Subject/Course#	Course Title	Cr. Hrs.	<u>Grade</u>			
1. 2. 3.						

Student Name:		Student I.D. #:			
Curriculum Record Form for an Academic Minor in Biology					
Minor: Department:	Biology Biology	Total credit hours required: 20.0 minimum			
Regulations G	overning Minor Co	urse Work:			

- 1. There shall be a minimum of 20.0 credit hours with a minimum Millersville QPA of 2.0.
- 2. Only one course which counts toward your major may be counted toward your minor.
- 3. Courses that count toward a minor are also eligible to be used to satisfy the current University-wide General Education requirements subject to normal distribution requirements.
- 4. At least two courses should be at the upper-division level (300-400). Exceptions may be requested upon evidence of program depth.
- 5. No course needed for the minor may be taken Pass-Fail.
- 6. One-half or more of the work required for the minor must be completed at Millersville University.
- 7. No student may minor in his or her major.

Course No.	Short Title	c.H.	Grade	Course No.	Short Title	C.H.	Grade
REQUIR	ED BIOLOGY COURSES (11.	0-12.0 с	redits)	ВІ	OLOGY ELECTIVES	(8.0-9.0 credits)	
BIOL 10	General Biology with a grade of B- or higher	3.0			ology electives at the styre of		
BIOL 10	Foundations of Biology with a grade of C- or higher	4.0			ed upon adviser's app	roval.	
Choose TV	VO of the following:			BIOL			
BIOL 21 BIOL 34 BIOL 36 BIOL 36	1 Concepts of Botany 3 Ecology & Evolution 2 Cell & Development	4.0 4.0 4.0 4.0		BIOL			

Note to the student: This form is provided as a guide. It is your responsibility to consult regularly with your adviser to be aware of changes and curriculum details which are not incorporated on this form.

Student Name:		Student I.D. #:			
Curricu	lum Record Form for an Academic	Minor in Molecular Biology/Biotechnology			
Minor: Department:	Molecular Biology/Biotechnology Biology	Total credit hours required: 18.0 minimum			
1. Ther	overning Minor Course Work: e shall be a minimum of 18,0 credit hours w				

- 2. Only one course which counts toward your major may be counted toward your minor.
- 3. Courses that count toward a minor are also eligible to be used to satisfy the current University-wide General Education requirements subject to normal distribution requirements.
- 4. At least two courses should be at the upper-division level (300-400). Exceptions may be requested upon evidence of program depth.
- 5. No course needed for the minor may be taken Pass-Fail.
- 6. One-half or more of the work required for the minor must be completed at Millersville University.
- 7. No student may minor in his or her major.

Course N	No.	Short Title	C.H.	Grade	Course No.	Short Title	C.H.	Grade
RE	QUIRE	D BIOLOGY COURSES (18.	0-19.0 c	redits)				
BIOL	100	General Biology with a grade of B- or higheroror	3.0					
BIOL	101	Foundations of Biology with a grade of C- or higher	4.0					
BIOL BIOL BIOL	362 364 462 466	Cell & Development	4.0 4.0 4.0 3.0					

Note to the student: This form is provided as a guide. It is your responsibility to consult regularly with your adviser to be aware of changes and curriculum details which are not incorporated on this form.

Comparison between BS Biology and BS Allied Health Technologies Degrees

Millersville University has traditionally offered three collaborative, university-hospital based degree programs. Each of these programs is designated as a 3/1 program in which students attend Millersville University for three years and then complete a one-year clinical program at an affiliated hospital. At the completion of the clinical phase of the program, the student is awarded a B.S. degree in Biology with an option in Medical Technology, Nuclear Medicine Technology, or Respiratory Therapy. Because the programs are all options within a biology degree program and include core courses required of all biology majors, the curriculum is rather rigid. There has been little opportunity to use courses that would better serve students who have chosen to prepare for a health care profession and stay within the 120-credit graduation limit. For example, our students are not required to take any courses that focus on the patient during the first three years at the university and generally do not take a biomedical-related course until their junior year.

A new degree program, begun in Fall 2009, awards a Bachelor of Science Degree in Allied Health Technologies. The restructuring of the curriculum creates a new degree that reduces some of the traditional Biology degree requirements, provides the flexibility to add important new courses, and allows the students to enroll in courses with a medical focus earlier in their academic career at Millersville University. Students will begin biomedical science courses in their freshman year.

This new B.S. Allied Health Technologies degree program will continue to meet all of the rigorous requirements needed to obtain certification in the health care professions but will provide a sharper focus on health care than does the B.S. Biology course of study that requires a broad base in the science of biology. The new degree is more likely to attract students whose interest's center on one of the health care professions. Many students who are interested in pursuit of a career in Allied Medical fields are more interested in the clinical aspects of those fields than in their biological underpinnings. The proposed B.S. in Allied Health Technology will still give these students a firm background in biology, chemistry, math, and physics while exposing them sooner and in greater depth to the courses that interest them most. This will afford students a greater opportunity for success and prepare them better for the careers to which they aspire.

The department also recognizes that some students will want to have an even stronger background in biology, math, and physics before they begin the clinical phase of their undergraduate education; therefore, it will keep its BS degree in Biology with options in Respiratory Therapy, Nuclear Medicine Technology, and Medical Technology for these students. This degree program is recommended for students who might be considering going to a graduate or professional school following completion of their clinical training.

MAJOR SEQUENCE AND DEGREE REQUIREMENTS BS BIOL and BS ALHT Medical Technology Side by Side Comparison

Major: BS BIOLOGY Option: MEDICAL TECHNOLOGY (Medical Laboratory Scients)	Major: BS ALLIED HEALTH TECHNOLOGIES Option: MEDICAL TECHNOLOGY (Medical Laboratory Science) Major Field Requirements: 30-32 credits				
	1 credits <i>0 credit</i> s		Major Field Requirements: 30-32 cred Clinical Education: 26 credits		
	0-21 credits	Other Require		redits	
•		•			
	2 (40 0	DECLUDED F	NOLOCY COURSES	1250 and 14a	
REQUIRED BIOLOGY COURSES BIOL 101 Foundations of Biology	•	REQUIRED	BIOLOGY COURSES	(25.0 Credits)	
BIOL 211 Concepts of Zoology	4.0	BIOL 100	General Biology	(3)	
BIOL 362 Cell & Development	4.0	BIOL 254	Human A&P 1	(4)	
BIOL 364 Genetics & Molecular E		BIOL 255	Human A&P 2	(4)	
		BIOL 257	Intro to Allied Hea		
REQUIRED MED BIOL COURSE	S (6 credits)	BIOL 362	Cell & Developme	* *	
BIOL 257 Intro to Allied Health	1.0	BIOL 364	Genetics & Molec		
BIOL 454 Immunology	2.0	BIOL 454	Immunology	(2)	
BIOL 461 General Micro	3.0	BIOL 461	Microbiology	(3)	
				• /	
ELECTIVES (8 credits)		DIRECTED E			
BIOL 356 or BIOL 254 & 255; and	MATH 235 are		minimum of two cou		
strongly recommended		below	(6	-8 credits)	
CLINICAL EDUCATION (30	credits)*	BIOL 211	Concepts of Zoology	y (4)	
At an affiliated hospital site-	creans)	BIOL 352	Nutritional Science	(3)	
Clinical Education for		BIOL 360	Histology	(3)	
Medical Technology		BIOL 363	Medical Micro	(3)	
wiedicar reciniology		BIOL 417	Parasitology	(3)	
		BIOL 437	Endocrinology	(3)	
DECLUBED DEL ATED (20 0 24 0) aradita)	BIOL 438	Neurobiology	(3)	
REQUIRED RELATED (20.0-21.0	r credits)	BIOL 455	CardioPulm Physio	(3)	
Obamietes (40 0 anadita)		BIOL 462	Molecular Biology	(4)	
Chemistry (16.0 credits)		BIOL 463 BIOL 465	Virology Developmental Bio	(4) (3)	
CHEM 111 Intro to Chemistry I	(4)	BIOL 463	Human Genetics	(3)	
CHEM 112 Intro to Chemistry	1 (4)	RESP 422	Pharmacology	(2)	
CHEM 235 Organic Chemistry	(4)	TEO! TEE	, namacology	(-)	
CHEM 326 Biochemistry	(4)				
•	. ,	CLINICAL EI	DUCATION (26	credits)*	
Mathematics (4-5 credits) - Mat	h 160		ed hospital site	•	
		Clinical edu			
Physics (4 credits) - Phys 131		Medical	Fechnology)		
		REQUIRED I	RELATED (27 credit	s)	
GENERAL ELECTIVES (as nece	ssary)	Chemistry (1	(6.0 credits)		
		CHEM 111	Intro to Chemistry I	(4)	
*Ninte: Oliminal advention and life	CHEM 112	Intro to Chemistry II	(4)		
*Note: Clinical education credits	CHEM 235	Organic Chemistry	(4)		
credits, and the number of credits	CHEM 326	Biochemistry	(4)		
the number of credits MU accepts	BB _ /!	· /7 154 · \			
number of credits required for the		Mathematics	s (/ credits)		
The clinical education component		MATHER	Ctatiation	(2)	
and BS ALHT degrees in Medical	Laboratory	MATH 130 MATH 160	Statistics Precalculus	(3)	
Science is identical.		WATE	Frediculus	(4)	

The above is for informal comparison only. See curriculum sheets for complete listing of requirements.

Physics (4 credits) - Phys 131

MAJOR SEQUENCE AND DEGREE REQUIREMENTS BS BIOL and BS ALHT Nuclear Medicine Technology Side by Side Comparison

Major: BS BIOLOGY Option: NUCLEAR MEDICINE TE Major Field Requirements: 2 Clinical Education 2 Other Requirements: 2		ation: 27 cre	IOLOGY credits dits	
		REQUIRED E	BIOLOGY COURSES (25	.0 credits)
REQUIRED BIOLOGY COURSES	S (16.0 credits)			,
BIOL 101 Foundations of Biology		BIOL 100	General Biology	(3)
BIOL 211 Concepts of Zoology	4.0	BIOL 254	Human A&P 1	(4)
BIOL 362 Cell & Development	4.0	BIOL 255	Human A&P 2	(4)
BIOL 364 Genetics & Molecular		BIOL 257	Intro to Allied Health	(1)
Broz ou r Contolloc a morocalar	5,0	BIOL 362	Cell & Development	(4)
REQUIRED NUC MED COURSE	S (9 credits)	BIOL 364	Genetics & Molec Bio	(4)
BIOL 257 Intro to Allied Health	1.0	BIOL 454	Immunology	(2)
BIOL 356 Functional Human Ana		BIOL 461	Microbiology	(3)
BIOL 375 Biometry	3.0			(-)
Biol of o Blomody	0.0	DIRECTED E	LECTIVES:	
				redits)
CLINICAL EDUCATION (28	credits)		(,
At an affiliated hospital site-	or ounce,	BIOL 211	Concepts of Zoology	(4)
Clinical Education for		BIOL 352	Nutritional Science	(3)
Nuclear Medicine Technol	oav	BIOL 360	Histology	(3)
Nacioal Medicine recinion	ogy .	BIOL 363	Medical Micro	(3)
		BIOL 417	Parasitology	(3)
REQUIRED RELATED (28-31 cre	adits)	BIOL 437	Endocrinology	(3)
MEGONIED MEENT LD (20-01 ON	Junoj	BIOL 438	Neurobiology	(3)
Chemistry (16.0 credits)		BIOL 455	CardioPulm Physio	(3)
Oneimany (10.0 Credita)		BIOL 462	Molecular Biology	(4)
CHEM 111 Intro to Chemistry	/ I (4)	BIOL 463	Virology	(4)
CHEM 112 Intro to Chemistry		BIOL 465	Developmental Bio	(3)
CHEM 235 Organic Chemistr		BIOL 467	Human Genetics	(3)
CHEM 326 Biochemistry	(4)	RESP 422	Pharmacology	(2)
Official October Biodifermony	(' ')	11201 122	. namacology	(-)
Mathematics (4-5 credits) - Mat	h 160 or 161	CLINICAL EI	DUCATION (26 cred ted hospital site	dits)
Physics (8-10 credits) -		Clinical Ed	lucation for Medicine Technology	
PHYS 131 Phys I w/Algebra	(4)		_,	
PHYS 132 Phys II w/Algebra				
or	. ,	REQUIRED F	RELATED (27 credits)	
PHYS 231 Phys I w/Calculus	s (5)			
PHYS 232 Phys II w/Calculu		Chemistry (1	6.0 credits)	
		CHENAGAG	lutus ta Chamiaturi	(4)
GENERAL ELECTIVES (as nece	ssary)	CHEM 111	Intro to Chemistry I	(4)
		CHEM 112	Intro to Chemistry II	(4)
		CHEM 235	Organic Chemistry	(4)
		CHEM 326	Biochemistry	(4)
*Note: Clinical education credits		N	(7114 -)	
credits, and the number of credits		Mathematics	(/ creaits)	
the number of credits MU accepts		MARTIL 400	04-4:-4:	(2)
number of credits required for the		MATH 130	Statistics	(3)
The clinical education component		MATH 160	Precalculus	(4)
and BS ALHT degrees in Medical Science is identical	Laboratory	Physics (4 c	redits) - Phys 131	

The above is for informal comparison only. See curriculum sheets for complete listing of requirements.

MAJOR SEQUENCE AND DEGREE REQUIREMENTS BS BIOL and BS ALHT Respiratory Therapy Side by Side Comparison

Major: BS BIOLOGY Option: RESPIRATORY THERAPY Major Field Requirements: 57 credits Other Requirements: 24-26 credits			Major: BS ALLIED HEALTH TECHNOLOGIE Option: RESPIRATORY THERAPY Major Field Requirements: 17 credits Clinical Education: 54 credits Other Requirements: 13 credits			
	IOLOGY COURSES (12 undations of Biology	2 credits) 4.0	,	OLOGY COURS		
	II & Development enetics & Molecular Bio	4.0 4.0	BIOL 100 BIOL 254 BIOL 255	General Biolog Human A&P 1 Human A&P 2	-	3.0 4.0 4.0
BIOL 257 Into BIOL 356 Fu	ESP COURSES (9 cr ro to Allied Health nctional Human Anat eneral Microbiology	edits) 1.0 5.0 3.0	BIOL 455 BIOL 461	CardioPulm Ph General Microl		3.0 3.0
CLINICAL COURSEWORK I (32 credits) Required for graduation from MU			CLINICAL COURSEWORK (54 credits) Required for graduation from MU			
CLINICAL COURSEWORK II (25 credits) Required for certification as a Respiratory Therapist						
REQUIRED R	ELATED (24.0-26.0 cre	edits)	REQUIRED RELATED (13 credits)			
Chemistry (10	6 credits)		Chemistry (6	.0 credits)		
CHEM 111 CHEM 112 CHEM 235 CHEM 326	Intro to Chemistry I Intro to Chemistry II Organic Chemistry Biochemistry	4.0 4.0 4.0 4.0	CHEM 103 CHEM 104	Gen Org & Bio Gen Org & Bio		3.0 3.0
Mathematics	(4-5 credits)		Mathematics	(3 credits)		
MATH 161	Calculus I OR	4.0	MATH 130	Statistics		3.0
MATH 163	Honors Calculus	5.0				
Physics (4 cr	edits)		Physics (4 cr	edits)		

The above is for informal comparison only. See curriculum sheets for complete listing of requirements.

PHYS 131

4.0

PHYS 131 Physics I with Algebra

Physics 1 with Algebra 4.0

Student Name:	Student I.D.#
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DEGREE:

BS

MAJOR REQUIREMENTS FOR A BS DEGREE IN

MAJOR:

ALHT

ALLIED HEALTH TECHNOLOGY: MEDICAL TECHNOLOGY

OPTION: MEDT

Total credit hours required: 120.0 minimum

REQUIREMENTS AND POLICIES FOR THE BS ALLIED HEALTH TECHNOLOGY MAJOR

A. Policies for Admission to the Major

- 1. New students (freshmen and transfers) must be admitted to the Allied Health Technology major by the Office of Admissions upon admission to the University.
- 2. Admission of Millersville University students to the Allied Health Technology major (from other departments or undeclared status) requires that the student is in satisfactory academic standing as described in the Undergraduate Catalog. Students who were dropped from the Allied Health Technology major also must satisfy the Allied Health Technology Retention in the Major criteria before being readmitted to an Allied Health Technology major.
- 3. Non-degree and continuing education students must be admitted to the Allied Health Technology major by the Office of Admissions.

B. Policies for Retention in the Major

- 1. University requirements for retention must be met.
- All Allied Health Technology ("ALHT") majors must earn grades of C- (C minus, 1.7) or higher in Biology courses required for their option (BIOL 254, 255, 362, 364, 454 and 461) and a satisfactory (S) grade in BIOL 257. All ALHT majors must earn a B- (B minus, 2.7) or higher in BIOL 100 or a C- (C minus, 1.7) or higher in BIOL 101. ALHT majors must also maintain a minimum 2.0 major GPA.
- 3. The requirements stated above must be satisfied before completion of 90 Millersville University credit hours.
- 4. Millersville University students changing majors, or Allied Health Technology majors changing options within the Allied Health Technology major, must satisfy the above requirements prior to completion of 45 additional Millersville University credit hours. Note: Students who desire to change their major to Allied Health Technology must refer to the Allied Health Technology Admission to the Major Policy (see above).
- 5. Transfer students with 60 credit hours or more must satisfy the above requirements prior to completion of 45 Millersville University credit hours. Transfer students with fewer than 60 credits should refer to the policy for all other majors (part #3 above).
- Any students failing to meet the above requirements will be dropped from the Allied Health Technology major. Students who wish to re-enter the major, must follow the requirements stipulated in part 4 above.

C. Policies for Completion of the Major

- 1. Completion of all University curricular requirements.
- 2. ENGL 312, Technical Writing, is the recommended course for the Upper Level Writing Requirement under the General Education Curriculum Requirements.
- 3. Completion of the clinical (hospital) phase is required for graduation in this option.

D. Admission to the clinical program is competitive and is not guaranteed.

Admission to the clinical (hospital) phase is competitive, and for acceptance, the following grades are recommended: B (3.0) or higher in CHEM 111, CHEM 112, BIOL 454, and BIOL 461.

Note to the student: This form is provided as a guide. It is your responsibility to consult regularly with your adviser to be aware of changes and curriculum details which are not incorporated on this form.

Student Name: Student I.D	#
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DEGREE: BS MAJOR REQUIREMENTS FOR A BS DEGREE IN

MAJOR: ALHT ALLIED HEALTH TECHNOLOGY:

NUCLEAR MEDICINE TECHNOLOGY

OPTION: NUCM Total credit hours required: 120.0 minimum

REQUIREMENTS AND POLICIES FOR THE BS ALLIED HEALTH TECHNOLOGY MAJOR

A. Policies for Admission to the Major

- 1. New students (freshmen and transfers) must be admitted to the Allied Health Technology major by the Office of Admissions upon admission to the University.
- 2. Admission of Millersville University students to the Allied Health Technology major (from other departments or undeclared status) requires that the student is in satisfactory academic standing as described in the Undergraduate Catalog. Students who were dropped from an Allied Health Technology major also must satisfy the Allied Health Technology Retention in the Major criteria before being readmitted to an Allied Health Technology major.
- 3. Non-degree and continuing education students must be admitted to the Allied Health Technology major by the Office of Admissions.

B. Policies for Retention in the Major

- 1. University requirements for retention must be met.
- 2. All Allied Health Technology ("ALHT") majors must earn grades of C- (C minus, 1.7) or higher in Biology courses required for their option (BIOL 254, 255, 362, 364, 454 and 461) and a satisfactory (S) grade in BIOL 257. All ALHT majors must earn a B- (B minus, 2.7) or higher in BIOL 100 or a C- (C minus, 1.7) or higher in BIOL 101. ALHT majors must also maintain a minimum 2.0 major GPA.
- 3. The requirements stated above must be satisfied before completion of 90 Millersville University credit hours.
- 4. Millersville University students changing majors, or Allied Health Technology majors changing options within the Allied Health Technology major, must satisfy the above requirements prior to completion of 45 additional Millersville University credit hours. Note: Students who desire to change their major to Allied Health Technology must refer to the Allied Health Technology Admission to the Major Policy (see above).
- 5. Transfer students with 60 credit hours or more must satisfy the above requirements prior to completion of 45 Millersville University credit hours. Transfer students with fewer than 60 credits should refer to the policy for all other majors (part #3 above).
- 6. Any students failing to meet the above requirements will be dropped from the Allied Health Technology major. Students who wish to re-enter the major, must follow the requirements stipulated in part 4 above.

C. Policies for Completion of the Major

- 1. Completion of all University curricular requirements.
- ENGL 312, Technical Writing, is the recommended course for the Upper Level Writing Requirement under the General Education Curriculum Requirements.
- 3. Completion of the clinical (hospital) phase is required for graduation in this option.

D. Admission to the clinical program is competitive and is not guaranteed.

Admission to the clinical (hospital) phase is competitive, and for acceptance, the following grades are recommended: B (3.0) or higher in BIOL 254 and BIOL 255; B- (B minus, 2.7) or higher in PHYS 131.

Note to the student: This form is provided as a guide. It is your responsibility to consult regularly with your adviser to be aware of changes and curriculum details which are not incorporated on this form.

MAJOR SEQUENCE AND DEGREE REQUIREMENTS

Major: BS Allied Health Technology

Option: NUCLEAR MEDICINE TECHNOLOGY

Major Field Requirements: 31.0-33.0 credits

Clinical Education: 26.0 credits Other Requirements: 27.0 credits When applicable, up to six of the REQUIRED RELATED courses may be credited toward the Liberal Arts Core subject

to normal distribution rules.

Course N	٥.	Short Title	C.H.	Grade	Q.P.	Course No	•	Short Title	C.H.	Grade	Q.P.
R	REQUIRED BIOLOGY COURSES (25.0 credits)				ts)	REQUIRED RELATED (28.0-31.0 credits)					
BIOL	100	General Biology	3.0			Chemis	try ('	16.0 credits)			
BIOL		Human Anat & Phys I	4.0					•	4.0		
BIOL		Human Anat & Phys II	4.0					Intro to Chemistry I Intro to Chemistry II	4.0	,	
BIOL	257	Intro Allied Health	1.0					Short Course Org C			
BIOL		Cell & Development	4.0					Biochemistry I	4.0		
BIOL		Genetics & Mol Biolog	•					•			
BIOL		Immunology	2.0					231* and CHEM 232	? (total 8.0) credits)	may
BIOL	461	General Microbiology	3.0					CHEM 235.	011514		.
		ECTED ELECTIVES (6		_		E .		C- or better in these HEM 235 or CHEM		ourses be	fore
		elow a minimum of 2 co		•		'	-				
BIOL		Concepts of Zoology	4.0	**********	·····	Students	who	o are considering goi	ng to grad	duate sch	ool or
BIOL		Nutritional Science	3.0					dical, dental, veterina			
BIOL		Histology	4.0			enroll in	scho	ol to become a phan	macist, pl	nysical the	erapist,
BIOL		Medical Microbiology	3.0					assistant after compl		r clinical t	raining
BIOL		Parasitology	3.0			SHOUL	IAT C	KE CHEM 231 and 2	32.		_
BIOL		Endocrinology	3.0 3.0	***************************************	·	·		•			
BIOL		Neurobiology		·				wishing to complete			
BIOL BIOL		Cardiopulmonary Physio Molecular Biology	4.0	. —				EM 265 (Quantitative	Analysis	i) in additi	ion to
BIOL		Virology	4.0			those Cl	HEM	courses listed.			İ
BIOL		Developmental Biology		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			45	/T.A. 11()			İ
BIOL		Human Genetics	3.0		-	. Matnem	atic	s (7.0 credits)			
RESP		Pharmacology	2.0			MATH MATH) Elements of Statisti) Precalculus	cs 3.0 4.0		
Upon d	NUCLEAR MED CLINICAL EDUCATION (26.0 credits) Upon completion of one year at the Lancaster General Hospital College of Nursing and Allied Health, 26.0 credit hours will be credited toward the B.S. degree in Allied Healt			graduate their clin	e sch ical _l	ents who might be int nool or professional s program SHOULD Al 0 credits)	chools af	ter comple	eting		
Techno	ology	with the Nuclear Medici	ne Tec	hnology c	ption.	PHYS	131	Physics I with Algel	ora 4.0		
Lanca: Allied		eneral Hospital College n 26.0 credits	of Nu	-		graduat	e scł	ents who might be in nool or professional s program SHOULD A	chools at	fter compl	eting
							_ (General Electives (a	ıs neces	sary)	-

									**		

Student Name:	 Student ID #	

DEGREE:

OPTION:

BS

MAJOR REQUIREMENTS FOR A BS DEGREE IN

ALLIED HEALTH TECHNOLOGY:

MAJOR: ALHT

PATR

PRE-ATHLETIC TRAINING

Total credit hours required: 120.0 minimum

REQUIREMENTS AND POLICIES FOR THE BS ALLIED HEALTH TECHNOLOGY MAJOR

A. Policies for Admission to the Major

- 1. New students (freshmen and transfers) must be admitted to the Allied Health Technology major by the Office of Admissions upon admission to the University.
- 2. Admission of Millersville University students to the Allied Health Technology major (from other departments or undeclared status) requires that the student is in satisfactory academic standing as described in the Undergradu ate catalog. Students who were dropped from a Allied Health Technology major also must satisfy the Allied Health Technology Retention in the Major criteria before being readmitted to an Allied Health Technology major.
- 3. Non-degree and continuing education students must be admitted to the Allied Health Technology major by the Office of Admissions.

B. Policies for Retention in the Major

- 1. University requirements for retention must be met.
- 2. All Allied Health Technology ("ALHT") majors must earn grades of C- (C minus, 1.7) or higher in Biology courses required for their option (BIOL 254, 255, 352, 362, 364, 375, and 461). ALHT majors must earn a B- (B minus, 2.7) or higher in BIOL 100 or a C- (C minus, 1.7) or higher in BIOL 101 as a prerequisite for other BIOL courses. All majors must also maintain a minimum 2.0 major GPA.
- 3. The requirements stated above must be satisfied before completion of 90 Millersville University credit hours.
- 4. Millersville University students changing majors, or Allied Health Technology majors changing options within the Allied Health Technology major, must satisfy the above requirements prior to completion of 45 additional Millersville University credit hours. Note: Students who desire to change their major to Allied Health Technology must refer to the Allied Health Technology Admission to the Major Policy (see above).
- 5. Transfer students with 60 credit hours or more must satisfy the above requirements prior to completion of 45 Millersville University credit hours. Transfer students with fewer than 60 credits should refer to the policy for all other majors (part #3 above).
- 6. Any students failing to meet the above requirements will be dropped from the Allied Health Technology major. Students who wish to re-enter the major, must follow the requirements stipulated in part 4 above.

C. Policies for Completion of the Major

- 1. Completion of all University curricular requirements.
- 2. ENGL 312, Technical Writing, is the recommended course for the Upper Level Writing Requirement under the General Education Curriculum Requirements.
- 3. Degree will be awarded after student has successfully completed one year of clinical education in an approved Athletic Training program.
- D. Admission to the master's level clinical program is competitive and not guaranteed.

Note to the student: This form is provided as a guide. It is your responsibility to consult regularly with your advisor to be aware of changes and curriculum details which are not incorporated on this form.

MAJOR SEQUENCE AND DEGREE REQUIREMENTS

Major: BS Allied Health Technology
Option: PRE-ATHLETIC TRAINING
Major Field Requirements: 53.0 credits
Clinical Education: variable # of credits

When applicable, up to six of the **REQUIRED RELATED** courses may be credited toward the Liberal Arts Core subject to normal distribution rules.

	Education: variable # of credits		to normal distribution rules.			
į.	Requirements: 31.0 credits		O N O T	0.11	.	
Course No.	Short Title C.	H. Grade	Course No. Short Title	C.H. Gra	ade	
RE	QUIRED BIOLOGY COURSES (28.0	credits)	REQUIRED RELATED (23.0 cre	dits)	l	
BIOL 1	100 General Biology	3.0	Chemistry (12.0 credits)			
BIOL 2	254 Human Anatomy & Physiology I	4.0	CHEM 111* Introductory Chemisty I	4.0		
BIOL 2	255 Human Anatomy & Physiology II		CHEM 112* Introductory Chemistry II	4.0	[
BIOL 3	352 Nutritional Science	3.0	CHEM 235 Short Course Organic Chemistr			
	362 Cell & Development	4.0	_			
1	364 Genetics & Molecular Biology	4.0	Note: CHEM 231* and CHEM 232 (total 8.0 c	redits) may		
	375 Biometry	3.0	substitute for CHEM 235.		Ì	
BIOL 4	161 General Microbiology	3.0	*Must earn a C- or better in these CHEM cou	rses before	i	
			completing CHEM 235 or CHEM 232.			
DEOL	HIDED Walliage 9 Charle Poisson C	`~	Students who are considering going to gradu			
REGI	UIRED Wellness & Sports Sciences C (18.0 credits)	ourses	or professional school (e.g., medical, physica			
	•		physician assistant) after completing their clir	iicai training	3	
		3.0	SHOULD TAKE CHEM 231 and 232.			
1		3.0			1	
	~	3.0	200 market		l	
Į.		3.0			1	
		3.0	Mathematics (4.0 credits)		ĺ	
WSSD 5	591 Exercise Physiology	3.0	MATH 160 Precalculus	4.0		
			Note: Students considering attending gradu	 uate school		
	INICAL EDUCATION (variable # of cr	adite)	or professional school SHOULD ALSO TAKE MATH			
	•		161.			
	mpletion of one year of clinical educat					
	Athletic Training Program, up to 40%		Physics (4.0 credits)			
,-	e credits will be counted towards the B	-				
Allied He	ealth Technology, Pre-Athletic Training	option.	PHYS 131 Physics I with Algebra	4.0	— [
•						
			Psychology (3.0 credits)			
			PSYC 356 Health Psychology	3.0		
			To the second se	~.~ <u></u>		
			NOTE: PSYC 100 and PSYC 227 or 228 (G3), sh they are prerequisites for PSYC 356.	ould be taker	n as	
			PHIL 100 (G1), SOC 101 or ANTH 121 (G3) BIOL	207 (D. \\\	المو	
			COMM 461 (P) are also recommended to help stu		aliu	
1			graduate school prerequisites.			
			Table 1		ļ	
<u> </u>						

ALHT-303

FALL 2017

Student I.D.#

DEGREE:	BS	MAJOR REQUIREMENTS FOR A BS DEGREE IN
MAJOR:	ALHT	ALLIED HEALTH TECHNOLOGY:
OPTION:	RESP	RESPIRATORY THERAPY Total credit hours required: 120.0 minimum

REQUIREMENTS AND POLICIES FOR THE BS ALLIED HEALTH TECHNOLOGY MAJOR

A. Policies for Admission to the Major

Student Name:____

- 1. New students (freshmen and transfers) must be admitted to the Allied Health Technology major by the Office of Admissions upon admission to the University.
- 2. Admission of Millersville University students to the Allied Health Technology major (from other departments or undeclared status) requires that the student is in satisfactory academic standing as described in the Undergraduate Catalog. Students who were dropped from an Allied Health Technology major also must satisfy the Allied Health Technology Retention in the Major criteria before being readmitted to an Allied Health Technology major.
- Non-degree and continuing education students must be admitted to the Allied Health Technology major by the Office of Admissions.

B. Policies for Retention in the Major

- 1. University requirements for retention must be met.
- 2. Admission to the professional phase of the Respiratory Therapy program is competitive and not guaranteed. Allied Health Technology (ALHT) majors in the Respiratory Therapy option must earn a grade of B- (B minus) or higher in BIOL 100 and grades of C- (C minus) or higher in all other required Biology and required-related courses (BIOL 254, 255, 461; CHEM 103, 104; MATH 130; PHYS 131) and have a minimum GPA of 2.5 in these courses. Note: Students will need to earn a B- or better in several math/science courses to achieve this GPA. Students must also maintain an overall GPA of 2.0.
- 3. BS ALHT Respiratory Therapy students who meet the minimum math/science GPA of 2.5 can schedule an interview with the admission committee for the professional phase of the Respiratory Therapy program. The committee will assess students on her/his academic performance, letters of recommendation, communication skills, understanding of the profession, maturity, and potential to succeed in the professional phase of the program. Students who score poorly during her/his interview may be denied admission into the professional phase of the program even if they have met the minimum math/science GPA requirement. Students denied admission into the professional phase of the program will be advised on how she/he can strengthen her/his credentials for re-application the following year or how they can complete the degree requirements for an alternative program. If seats are available in the professional phase of the program, students who have not met the minimum math/science GPA may be interviewed and, if accepted, will be admitted on a probationary basis.
- 4. The BS ALHT Respiratory Therapy is a 2+2 year program. All of the above requirements must be satisfied before a student can begin the professional phase of the program, except for BIOL 352 which is completed during the professional phase.
- 5. Transfer students must meet all University requirements before she/he can begin the professional phase.
- 6. Any students failing to meet the above requirements will be dropped from the Allied Health Technology major.

C. Policies for Completion of the Major

- 1. Completion of all University curricular requirements, except for the Perspectives (P) course, which is waived.
- 2. ENGL 312, Technical Writing, is the recommended course for the Upper Level Writing Requirement under the General Education Curriculum Requirements.
- D. Admission to the professional phase is competitive and is not guaranteed (see part B above).

Note to the student: This form is provided as a guide. It is your responsibility to consult regularly with your advisor to be aware of changes and curriculum details which are not incorporated on this form.

MAJOR SEQUENCE AND DEGREE REQUIREMENTS

Major: BS Allied Health Technology: 2 + 2 program

Option: Respiratory Therapy

Major Field Requirements: 17.0 credits
Professional Education: 54.0 credits
Other Requirements: 13.0 credits

When applicable, up to six of the **REQUIRED RELATED** courses may be credited toward the Liberal Arts Core subject to normal distribution rules.

ALHT 404 SUMMER 2015

Course No	0.	Short Title	C.H.	Grade	Course No.	Short Title	C.H.	Grade	
RI	EQUI	RED BIOLOGY COURSES (17.	0 cred	lits)	REQUIRED RELATED (13.0 credits)				
BIOL BIOL BIOL BIOL BIOL	254 255 352	General Biology Human Anatomy & Physiology Human Anatomy & Physiology Nutritional Science General Microbiology		<u></u>	CHEM 16 CHEM 16 Note: Stu	y (6.0 credits) (G2 Courses) 03 General, Organic & Bioche 04 General, Organic & Bioche dents who are considering goin	m II 3.0 g to gradi		
RESP THER PROFESSIONAL EDUCATION (54.0 credits Upon completion of approximately 2 years at the Lancaster Regional Medical Center (MU/LRMC Consortium), 54.0 credit hours will be credited toward the B.S. degree in Allied Health Technology with the Respiratory Therapy option.					wanting to cal therap clinical tra	attending medical, dental, veter o enroll in school to become a poist, or physician assistant after aining SHOULD TAKE CHEM 1' completing all four can substitu	harmacis completir 11*, 112*,	st, physi- ng their 231*	
Profess	sional	Education at Lancaster RMC (5	4.0 cre	edits) 🗆		n a C- or better in these CHEM ig CHEM 232.	courses	before	
RESP		Acute Cardiopulmonary Care	2.0		Mathema	itics (3.0 credits)			
RESP	411 412	Respiratory Care Techniques I Prin. Aerosol & Gas Therapy	2.0 3.0		MATH	130 Elements of Statistics I	3.0		
RESP RESP RESP RESP	413 414 415	Respiratory Assess & Therap. Respiratory Care Techniques II Tech Aspects Mech Ventilation Respiratory Care Techniques II	4.0 3.0 3.0		ate school	dents who might be interested i ol or professional schools after on the phase SHOULD ALSO TAK	ompleting	g their	
RESP		Respiratory Care in Alt Sites	2.0		Physics	(4.0 credits) (G2 Course)			
RESP		Arterial Blood Gas Analysis	3.0		PHYS 1	31 Physics I with Algebra	4.0		
RESP RESP RESP	423 424	Pharmacology Infectious Diseases Noninfectious Diseases	2.0 2.0 2.0 2.0		school or p	idents who might be interested in a professional school programs after al phase SHOULD ALSO TAKE PH	completing		
RESP		Neonatology for Resp Therapis Clinical Practice I			Suggeste	ed Additional Courses (no mi	ոimum)		
RESP RESP RESP RESP	461 462 463 464	Clinical Practice I Clinical Practice II Clinical Practicum II Clinical Practicum III Respiratory Care Research	1.0 2.0 1.0 3.0 10.0 2.0		BIOL 4 BIOL 4 CSCI* _ GERT 1	 75 Biometry 54 Immunology 63 Virology 70 Intro to Gerontology 85 Moral Problems in Medicin 	3.0 2.0 4.0 3.0 3.0 e 3.0		
3		P 417 will count towards the Wri	ting (V	V)	*Numbe	ered CSCI 140 or above.			
					in Respira	dents may instead follow the B. atory Therapy to prepare for the the MU Respiratory Therapy pro	profession		
					in medica Biology, F & 232 in I	ory Therapy students who might or graduate school should selection and Respiratory Therapy option and ieu of CHEM 235. This option a mysics requirement for medical s	ect the B. select CH Iso meets	S. in HEM 231	

Student Name:		Student ID #
DEGREE:	BS	MAJOR REQUIREMENTS FOR A BS DEGREE IN
MAJOR:	ALHT	ALLIED HEALTH TECHNOLOGY:
OPTION:	SPMD	SPORTS MEDICINE Total gradit bours required: 120.0 minimum
<u> </u>		Total credit hours required: 120.0 minimum
REQUIR	EMENTS A	AND POLICIES FOR THE BS ALLIED HEALTH TECHNOLOGY MAJOR
A Policies	for Admies	sion to the Major
		reshmen and transfers) must be admitted to the Allied Health Technology major by the Office of
		n admission to the University.
		llersville University students to the Allied Health Technology major (from other departments or us) requires that the student is in satisfactory academic standing as described in the Undergradu-
ate	e catalog. Stu	dents who were dropped from an Allied Health Technology major also must satisfy the Allied
		ogy Retention in the Major criteria before being readmitted to an Allied Health Technology major.
	fice of Admiss	d continuing education students must be admitted to the Allied Health Technology major by the sions
		ion in the Major
1. Un	iversity requi	rements for retention must be met.
		Technology ("ALHT") majors must earn grades of C- (C minus, 1.7) or higher in Biology courses ir option (BIOL 254, 255, 352, 362, 364, 375, and 461). ALHT majors must earn a B- (B minus,
2.7) or higher in	BIOL 100 or a C- (C minus, 1.7) or higher in BIOL 101 as a prerequisite for other BIOL courses.
		also maintain a minimum 2.0 major GPA. is stated above must be satisfied before completion of 90 Millersville University credit hours.
4. Mil	llersville Univ	ersity students changing majors, or Allied Health Technology majors changing options within the
		chnology major, must satisfy the above requirements prior to completion of 45 additional ersity credit hours. Note: Students who desire to change their major to Allied Health Technology
		e Allied Health Technology Admission to the Major Policy (see above).
		ts with 60 credit hours or more must satisfy the above requirements prior to completion of 45
		ersity credit hours. Transfer students with fewer than 60 credits should refer to the policy for all art #3 above).
		iling to meet the above requirements will be dropped from the Allied Health Technology major.
		rish to re-enter the major, must follow the requirements stipulated in part 4 above.
		etion of the Major III University curricular requirements.
		hnical Writing, is the recommended course for the Upper Level Writing Requirement under the
Ge	eneral Educat	ion Curriculum Requirements.
D. Admissi	on to gradi	uate and professional schools is competitive and not guaranteed.

Note to the student: This form is provided as a guide. It is your responsibility to consult regularly with your advisor to be aware of changes and curriculum details which are not incorporated on this form.

MAJOR SEQUENCE AND DEGREE REQUIREMENTS

Major: BS Allied Health Technology Option: SPORTS MEDICINE

Major Field Requirements: 53.0 credits Other Requirements: 31.0 credits

When applicable, up to six of the **REQUIRED RELATED** courses may be credited toward the Liberal Arts Core subject to normal distribution rules.

Citter Med	uirements: 31.0 creatts	 	to normal distribution rules.	
Course No.	Short Title C	.H. Grade	Course No. Short Title	C.H. Grade
REQU	IRED BIOLOGY COURSES (28.0	credits)	REQUIRED RELATED (31.0 c	redits)
BIOL 100 BIOL 254 BIOL 255 BIOL 362 BIOL 364 BIOL 375 BIOL 461 REQUIR WSSD 311 WSSD 375 WSSD 450	General Biology Human Anatomy & Physiology I Human Anatomy & Physiology II Nutritional Science Cell & Development Genetics & Molecular Biology Biometry General Microbiology RED Wellness & Sports Sciences (19.0 credits) First Aid & CPR Prevent. & Care Kinesiology Nutrition for Perf. Enhancement	3.0 4.0 4.0 3.0 4.0 4.0 3.0 3.0 3.0 3.0	Chemistry (16.0 credits) CHEM 111* Introductory Chemisty I CHEM 112* Introductory Chemistry II CHEM 235 Short Course Organic Chemist CHEM 326 Biochemistry 1 Note: CHEM 231* and CHEM 232 (total 8.0 substitute for CHEM 235. *Must earn a C- or better in these CHEM cocompleting CHEM 235 or CHEM 232. Students who are considering going to grad or attending professional school (e.g., meditherapy, physician assistant) SHOULD TAK and 232.	4.0 4.0 stry 4.0 4.0 credits) may surses before uate school cal, physical
WSSD 591	Sport Psychololgy Exercise Physiology Seminar in Sports Science ELECTIVES (6.0 credits)	3.0	Mathematics (4.0 credits) MATH 160 Precalculus Note: Students considering attending gra- or professional school SHOULD ALSO TA 161.	
BIOL 363 BIOL 454 BIOL 454 BIOL 463 BIOL 463 BIOL 465 BIOL 498	Co-op Biology Immunology Medical Microbiology Neurobiology Virology Developmental Biology Independent Study	3.0 2.0 3.0 3.0 3.0 3.0 1.0-3.0	Physics (4.0 credits) PHYS 131 Physics I with Algebra PHYS 132 Physics II with Algebra Psychology (3.0 credits) PSYC 356 Health Psychology NOTE: PSYC 100 and PSYC 227 or 228 (G3) s	4.0 4.0 3.0
WSSD 300 WSSD 400	Legal Aspects of Sport Co-op in Wellness Co-op in Wellness Independent Study	3.0 3.0 3.0 1.0-3.0	they are prequisites for PSYC 356. PHIL 100 (G1), SOC 101 or ANTH 121 (G3) BIC COMM 461 (P) are also recommended to help s graduate school prerequisites.	DL 207 (D, W) and

ALHT-304

FALL 2017

DEGREE: MAJOR: OPTION:	BA BIOL	MAJOR REQUIREMENTS FOR A BA DEGREE IN BIOLOGY Total credit hours required: 120.0 minimum

REQUIREMENTS AND POLICIES FOR THE BA BIOLOGY MAJOR

A. Policies for Admission to the Major

- 1. New students (freshmen and transfers) must be admitted to the Biology major by the Office of Admissions upon admission to the University.
- 2. Admission of Millersville University students to the Biology major (from other departments or undeclared status) requires that the student is in satisfactory academic standing as described in the Undergraduate Catalog. Students who were dropped from a Biology major also must satisfy the Biology Retention in the Major criteria before being readmitted to a Biology major.
- Non-degree and continuing education students must be admitted to the Biology major by the Office of Admissions.

B. Policies for Retention in the Major

1. University requirements for retention must be met.

Student Name:_____ Student ID#__

- 2. All Biology majors must earn grades of C- (C minus) or higher in all core courses (BIOL 101, 211, 221, 343, 362, 364) required for their option.
- 3. The requirements stated above must be satisfied before completion of 90 Millersville University credit hours.
- 4. Millersville University students changing majors, or Biology majors changing options within the Biology major, must satisfy the above requirements prior to completion of 45 additional Millersville University credit hours.

Note: Students who desire to change their major to Biology must refer to the Biology department's Admission to the Major Policy. Those transferring into the major may substitute BIOL 100 for BIOL 101 if they earn a grade of B- (B minus) or higher in this course.

- 5. Transfer students with 60 credit hours or more must satisfy the above requirements prior to completion of 45 Millersville University credit hours. Transfer students with fewer than 60 credits should refer to the policy for all other majors (part #3 above).
- 6. Any students failing to meet the above requirements will be dropped from the Biology major.

 Students who wish to re-enter the major must follow the requirements stipulated in part 4 above.

C. Policies for Completion of the Major

- 1. Completion of all University curricular requirements.
- 2. ENGL 312, Technical Writing, is the recommended course for the Upper Level Writing Requirement under the General Education Curriculum Requirements.

Note to the student: This form is provided as a guide. It is your responsibility to consult regularly with your adviser to be aware of changes and curriculum details which are not incorporated on this form.

MAJOR SEQUENCE AND DEGREE REQUIREMENTS

Major: BA BIOLOGY When applicable, up to six of the REQUIRED RELATED Option: courses may be credited toward the Liberal Arts Core subject Major Field Requirements: 33.0 credits to normal distribution rules. Other Requirements: 34.0-51.0credits C.H. Course No. Short Title Grade Course No. Short Title C.H. Grade REQUIRED RELATED (34.0 - 51.0 credits) REQUIRED BIOLOGY COURSES (25.0-26.0 credits) Chemistry (16.0 credits)
CHEM 111* Intro Chemistry I BIOL 101 Foundations of Biology 4.0 211 Concepts of Zoology 4.0 BIOL CHEM 112 Intro Chemistry II 4.0 BIOL 221 Concepts of Botany 4.0 CHEM**___ CHEM** 4.0 BIOL 343 Ecology & Evolution 4.0 4.0 BIOL 362 Cell & Development 4.0 *Must earn a C- or better in order to take CHEM 112. BIOL 364 Genetics & Mol. Biology 4.0 ** At the 200 level or above. --- AND --- ---1.0-2.0 ____ BIOL 470 Biology Colloquium --- OR --- ---Earth Sciences (3.0-4.0 credits) 1.0-2.0 BIOL 472 Seminar in Biology ESCI* **BIOLOGY ELECTIVES (7.0-8.0 credits)** * At the 200 level or above. In consultation with your advisor, choose additional biology courses approved for the major to bring total biology credits Mathematics & Computer Science (7.0-9.0 credits) to 33.0. MATH 161 Calculus I BIOL --- --- Of --- ---BIOL ___ MATH 163 Honors Calculus 5.0 BIOL --- --- AND---BIOL MATH* BIOL --- or --- ---CSCI* 4.0 *Note: Only MATH courses numbered 160 or above OR CSCI courses numbered 140 or above may be used to fulfill these requirements. Physics (8.0 - 10.0 credits) PHYS 131 Physics I with Algebra 4.0 PHYS 132 Physics II with Algebra 4.0 ---- ---- 0/ ---- ----PHYS 231 Physics I with Calculus 5.0 PHYS 232 Physics II with Calculus 5.0 Foreign Language (0 - 12.0 credits) Competency through the intermediate level is required. Pass/fail may be elected. 101 Elementary I 3.0 102 Elementary II 3.0 201 Intermediate I 3.0 202 Intermediate II General Electives (as necessary)

BI-128 FALL 2009.2

Student ID #

Otadom		GRACINED II	
DEGREE: MAJOR: OPTION:	BS BIOL	MAJOR REQUIREMENTS FOR A BS DEGREE IN BIOLOGY Total credit hours required: 120.0 minimum	

REQUIREMENTS AND POLICIES FOR THE BS BIOLOGY MAJOR

A. Policies for Admission to the Major

Student Name:

- 1. New students (freshmen and transfers) must be admitted to the Biology major by the Office of Admissions upon admission to the University.
- 2. Admission of Millersville University students to the Biology major (from other departments or undeclared status) requires that the student is in satisfactory academic standing as described in the Undergraduate catalog. Students who were dropped from a Biology major also must satisfy the Biology Retention in the Major criteria before being readmitted to a Biology major.
- Non-degree and continuing education students must be admitted to the Biology major by the Office of Admissions.

B. Policies for Retention in the Major

- 1. University requirements for retention must be met,
- 2. All Biology majors must earn grades of C- (C minus) or higher in all core courses (BIOL 101, 211, 221, 343, 362, 364) required for their option.
- 3. The requirements stated above must be satisfied before completion of 90 Millersville University credit hours.
- 4. Millersville University students changing majors, or Biology majors changing options within the Biology major, must satisfy the above requirements prior to completion of 45 additional Millersville University credit hours. Note: Students who desire to change their major to Biology must refer to the Biology department's Admission to the Major Policy. Those transferring into the major may substitute BIOL 100 for BIOL 101 if they earn a grade of B- (B minus) or higher in this course.
- 5. Transfer students with 60 credit hours or more must satisfy the above requirements prior to completion of 45 Millersville University credit hours. Transfer students with fewer than 60 credits should refer to the policy for all other majors (part 3 above).
- 6. Any students failing to meet the above requirements will be dropped from the Biology major. Students who wish to re-enter the major, must follow the requirements stipulated in part 4 above.

C. Policies for Completion of the Major

- 1. Completion of all University curricular requirements.
- 2. ENGL 312, Technical Writing, is the recommended course for the Upper Level Writing Requirement under the General Education Curriculum Requirements.

Note to the student: This form is provided as a guide. It is your responsibility to consult regularly with your adviser to be aware of changes and curriculum details which are not incorporated on this form.

MAJOR SEQUENCE AND DEGREE REQUIREMENTS

Major: BS BIOLOGY

Major: BS BIOLOGY Option: Major Field Requirements: 43.0 credits					courses	may	able, up to six of the REQU I be credited toward the Libe tribution rules.		
•		rements: 35.0-39.0credits			10 110111	iai aio	u pato, ri aloo.		
Course No).	Short Title	C.H.	Grade	Course No		Short Title	C.H.	Grade
REQU	IRED	BIOLOGY COURSES (25.0-2	26.0 cred	lits)	ľ		JIRED RELATED (35.0 - 39	0.0 credits)
BIOL BIOL BIOL BIOL BIOL BIOL	211 221 343 362 364	Foundations of Biology Concepts of Zoology Concepts of Botany Ecology & Evolution Cell & Development Genetics & Mol. Biology AND Biology Colloquium	4.0 4.0 4.0 4.0 4.0 4.0 1.0-2.0		CHEM CHEM CHEM CHEM CHEM *Must 6	111* 112* 231* 232 326 earn a	0.0 credits) Intro Chemistry I Intro Chemistry II Organic Chemistry I Organic Chemistry II Biochemistry I C- or better in these CHEM eting CHEM 232.	4.0 4.0 4.0 4.0 4.0 4.0	
BIOL		Seminar in Biology	1.0-2.0		Note: T	hose	wishing to complete a Cher te CHEM 265 (Quantitative		
BIOLO	GY EI	ECTIVES (17.0-18.0 credits)				ose CHEM courses listed.	,a.,, .	
In consultation with your advisor, choose additional biology courses approved for the major to bring total biology credits to 43.0. A minimum of 12 elective credits must be at the			Mather MATH		s & Computer Science (7.0 Calculus I	0-9.0 credi 4.0	ts)		
BIOL_ BIOL_ BIOL_	_ `			, , , , , , , , , , , , , , , , , , , 	MATH MATH*		Honors Calculus	5.0	
BIOL_ BIOL_					CSCI*		Of	4.0	
BIOL_ BIOL_ BIOL_					CSCI c	ourse	MATH courses numbered 10 s numbered 140 or above r equirements.		
		e planning to apply to graduate d inquire about specific admis			Physic	:s (8.0) - 10.0 credits)		
		e program of their choice.		•			Physics I with Algebra Physics II with Algebra	4.0 4.0	
							Physics I with Calculus Physics II with Calculus	5.0 5.0	
						(General Electives (as nece	essary)	
			-						
									ĺ
									-
]									-

Student Name:		Student I.D.#	
DEGREE: MAJOR: OPTION:	BSE BIOL	MAJOR REQUIREMENTS FOR A BSE DEGREE IN BIOLOGY Total credit hours required: 126.0 minimum	_

REQUIREMENTS AND POLICIES FOR THE BSE BIOLOGY MAJOR

A. Policies for Admission to the Major

- 1. New students (freshmen and transfers) must be admitted to the Biology major by the Office of Admissions upon admission to the University.
- 2. Admission of Millersville University students to the Biology major (from other departments or undeclared status) requires that the student is in satisfactory standing as described in the Undergraduate Catalog. Students who were dropped from a Biology major also must satisfy the Biology Retention in the Major criteria before being readmitted to a Biology major.
- Non-degree and continuing education students must be admitted to the Biology major by the Office of Admissions.

B. Policies for Retention in the Major

- 1. University requirements for retention must be met.
- 2. All Biology majors must earn grades of C- (C minus) or higher in all core courses (BIOL 101, 211, 221, 343, 362, 364) required for their option.
- 3. The requirements stated above must be satisfied before completion of 90 Millersville University credit hours.
- 4. Millersville University students changing majors, or Biology majors changing options within the Biology major, must satisfy the above requirements prior to completion of 45 additional Millersville University credit hours.
 - Note: Students who desire to change their major to Biology must refer to the Biology department's Admission to the Major Policy. Those transferring into the major may substitute BIOL 100 for BIOL 101 if they earn a grade of B- (B minus) or higher in this course.
- 5. Transfer students with 60 credit hours or more must satisfy the above requirements prior to completion of 45 Millersville University credit hours. Transfer students with fewer than 60 credits should refer to the policy for all other majors (part 3 above).
- 6. Any students failing to meet the above requirements will be dropped from the Biology major. Students who wish to re-enter the major, must follow the requirements stipulated in part 4 above.

C. Policies for Completion of the Major

- 1. Completion of all University curricular requirements, except for the Perspectives (P) course, which is waived.
- 2. ENGL 312, Technical Writing, is the recommended course for the Upper Level Writing Requirement under the General Education Curriculum Requirements.
- 3. Admission to Advanced Professional Studies, whose several requirements include an overall GPA of 3.0, completion of a literature course in the English department, and appropriate clearances.

Note to the student: This form is provided as a guide. It is your responsibility to consult regularly with your adviser to be aware of changes and curriculum details which are not incorporated on this form.

When applicable, up to six of the REQUIRED RELATED

Major: BSE BIOLOGY

Option: courses may be credited toward the Liberal Arts Core subject Major Field Requirements: 32.0 credits to normal distribution rules. Other Requirements: 64.0-68.0credits Course No. Short Title C.H. Course No. Short Title C.H. Grade REQUIRED RELATED (31.0 - 35.0 credits) **REQUIRED BIOLOGY COURSES (28.0 credits)** Chemistry (16.0 credits) BIOL 101 Foundations of Biology 4.0 CHEM 111* Intro Chemistry I 4.0 211 Concepts of Zoology 4.0 BIOL CHEM 112* Intro Chemistry II 4.0 BIOL 221 Concepts of Botany 4.0 CHEM 235 Short Course Org. Chem 4.0 BIOL 343 Ecology & Evolution 4.0 CHEM 326 Biochemistry I 4.0 362 Cell & Development BIOL 4.0 Note: CHEM 231* and CHEM 232 (total 8.0 credits) BIOL 364 Genetics & Mol, Biology 4.0 may substitute for CHEM 235. BIOL 375 Biometry 3.0 BIOL 473 Methods Teach Biology 1.0 *Must earn a C- or better in these CHEM courses **BIOLOGY ELECTIVES (4.0 credits)** before completing CHEM 235 or 232. In consultation with your advisor, choose additional biology courses approved for the major to bring total biology credits Note: Students who are considering going to graduto 32.0. ate school to earn an advanced degree in Biology BIOL SHOULD TAKE CHEM 231 and 232. BIOL ____ BIOL Note: Those wishing to complete a Chemistry minor must complete CHEM 265 (Quantitative Analysis) in PROFESSIONAL EDUCATION (33.0 credits) addition to those CHEM courses listed. Foundations Bloc Earth Sciences (3.0-4.0 credits) EDFN 211 Foundation Modern Ed 3.0 ESCI* EDFN 241 Psyc Found Teach 3.0 * At the 200 level or above. EDFN 001: Prof. Bloc, Science (requires APS status) Mathematics (4.0-5.0 credits) EDFN 321 Issues in Sec. Educ. 3.0 MATH 160 Precalculus EDFN 330 Instruct. Tech. Des. 3.0 4.0 --- --- 0/ --- ---EDSE 340 Content Area Literacy 3.0 MATH 161 Calculus I SPED 346 Sec Students w/Disabilities 3.0 --- --- or --- ---EDSE 435 Teaching of Science* 3.0 MATH 163 Honors Calculus 5.0 * EDSE 435 offered in Fall semester only. *Note: Students who might be interested in graduate school Professional Bloc II or professional school SHOULD TAKE MATH 161. EDSE 471 Differentiating Instruction 3.0 EDSC 461 Student Teaching 9.0 Physics (8.0 - 10.0 credits) PHYS 131 Physics I with Algebra 4.0 PHYS 132 Physics II with Algebra Admission to Advanced Professional Studies 4.0 ---- ---- Of ----& Certification (APS) PHYS 231 Physics I with Calculus 5.0 All students enrolled in teacher preparation programs PHYS 232 Physics II with Calculus must be admitted to Advanced Professional Studies and meet Pennsylvania state requirements and univer-General Electives (as necessary) sity requirements prior to being enrolled in their initial advanced Professional Studies course. Students must meet additional Pennsylvania state requirements in order to be certified. Listings of Advanced Professional Studies courses and requirements are available in each department office, the Early Field Experiences office, and on the Early Experiences website.

Student Name:	 Student ID #

DEGREE:

BS

MAJOR REQUIREMENTS FOR A

BIOL MAJOR:

BS DEGREE IN BIOLOGY: ANIMAL BEHAVIOR

OPTION:

ANBE

Total credit hours required: 120.0 minimum

REQUIREMENTS AND POLICIES FOR THE BS BIOLOGY MAJOR

A. Policies for Admission to the Major

- 1. New students (freshmen and transfers) must be admitted to the Biology major by the Office of Admissions upon admission to the University.
- 2. Admission of Millersville University students to the Biology major (from other departments or undeclared status) requires that the student is in satisfactory academic standing as described in the Undergraduate catalog. Students who were dropped from a Biology major also must satisfy the Biology Retention in the Major criteria before being readmitted to a Biology major.
- 3. Non-degree and continuing education students must be admitted to the Biology major by the Office of Admissions.

B. Policies for Retention in the Major

- 1. University requirements for retention must be met.
- 2. All Biology majors must earn grades of C- (C minus) or higher in all core courses (BIOL 101, 211, 221, 343, 362, 364) required for their option.
- 3. The requirements stated above must be satisfied before completion of 90 Millersville University credit hours.
- 4. Millersville University students changing majors, or Biology majors changing options within the Biology major, must satisfy the above requirements prior to completion of 45 additional Millersville University credit hours. Note: Students who desire to change their major to Biology must refer to the Biology department's Admission to the Major Policy. Those transferring into the major may substitute BIOL 100 for BIOL 101 if they earn a grade of B- (B minus) or higher in this course.
- 5. Transfer students with 60 credit hours or more must satisfy the above requirements prior to completion of 45 Millersville University credit hours. Transfer students with fewer than 60 credits should refer to the policy for all other majors (part 3 above).
- 6. Any students failing to meet the above requirements will be dropped from the Biology major. Students who wish to re-enter the major, must follow the requirements stipulated in part 4 above.

C. Policies for Completion of the Major

- 1. Completion of all University curricular requirements.
- 2. ENGL 312, Technical Writing, is the recommended course for the Upper Level Writing Requirement under the General Education Curriculum Requirements.

Major: BS BIOLOGY

Option: ANIMAL BEHAVIOR

Major Field Requirements: **46.0 credits** Other Requirements: **34.0-37.0credits**

When applicable, required related courses may be credited toward the Liberal Arts Core, subject to normal substitution rules.

O N	•	Object Title	0.11	04.	Cauraa N		Chart Title	C 11	Crado
Course No	0.	Short Title	C.H.	Grade	Course N		Short Title	C.H.	Grade
REC	QUIRE	ED BIOLOGY COURSES (24.	0 credit	s)	l		UIRED RELATED (34.0 - 37	.u credits	5)
BIOL	101	Foundations of Biology	4.0				16.0 credits)		
BIOL		Concepts of Zoology	4.0				Introductory Chemistry I	4.0	
BIOL		Concepts of Botany	4.0		E .		Introductory Chemistry II	4.0	
BIOL		Ecology & Evolution	4.0		CHEM	235	Short Course Organic Chen	nistry 4.0	
BIOL		Cell & Development	4.0		CHEM	326	Biochemistry I	4.0	
i .		Genetics & Molecular Biology			OR	020	Bloomermony 1	1.0	
BIOL	304	Genetics & Molecular biology	4.0		3	375	Environmental Chemistry	4.0	
REOLUI	SED V	NIMAL BEHAVIOR COURSES (*	11 014 0	cradite)	1		-		
1		(10.0 credits)	11.0 14.0	ordano,			s aiming for Veterinary Schools		
BIOL		Principles of Animal Behavior	· 3 Ո				M 232 in lieu of CHEM 235, and in CHEM 375.	i snould lar	(e Cheivi
DIOL	505	r filiciples of Affilia behavior	3.0		326 raun	er ma	III CHEW 3/5.		
BIOL	484	Mechanisms of An. Behavior	3.0		ľ				
OR							s (4.0-5.0 credits)		
BIOL	435	Animal Physiology	3.0			151	Calculus for Management	4.0	
BIOL	486	Behavioral Ecology	3.0		OR				
OR	400	Denavioral Ecology	5.0		MATH	161	Calculus I	4.0	
BIOL	183	Applied Ethology	3.0		OR				
BIOL	403	Applied Eurology	3.0		MATH	163	Honors Calculus	5.0	
BIOL	472	Seminar on Animal Behavior	1.0						
Drastic	al Eva	oriones in Animal Pahavier (4.0	140 000	dita)	Statist	ics (3	i.0 credits)		
		erience in Animal Behavior (1.0 with your advisor, select a Co-op			BIOL	375	Biometry	3.0	
		ct in animal behavior.	i, internsi	яµ, ог	OR		2.0	-,-	
BIOL		400 or 500 Co-op	3.0			235	Survey of Statistics	3.0	
BIOL		Honors Independent Study	1.0-4.0	\	OR				
BIOL		Independent Study in Biology				211	- Statistics & Exper Design I	3.0	
BIOL		Honors Thesis in Biology	1.0-4.0						·····
	100	Thomas Theolo III Dielogy	1.0 1.0	<i>'</i> ——					
REQUI	RED I	ELECTIVES (9.0-11.0 credits))		Physic	s (8.0	0 - 10.0 credits)		
1		with your advisor, select addition		es from	PHYS	131	Physics I with Algebra	4.0	
		above, or from the list below that v			PHYS	132	Physics II with Algebra	4.0	
		ea of interest in animal behavior.		•	,		OR		***************
0	.m. D.	and Dialogy			PHYS	231	Physics I with Calculus	5.0	
1 -		sed Biology	2.0		PHYS			5.0	**************
BIOL		Marine Invertebrates	3.0		1		,		terinologic and the second
BIOL		Ornithology	3.0		L				
BIOL		Ichthyology	3.0				(3.0 credits)		
BIOL		Mammology	3.0		PSCY	100	General Pyschology	3.0	
BIOL		Entomology	3.0						
BIOL	41 0	Aquatic Entomology	3.0		1				
							ts may consider completing a m		
1		of Behavior	4.0				ppropriate courses for biology n		ide the
BIOL		Compar Vertebrate Anatomy	4.0		followin	ig: PS	SYC 216, PSYC 315 and PSYC	316.	
BIOL		Nutritional Science	3.0		A .1 .152	;	te. Ottodente interesetado NO	-i	8_6
BIOL		Endocrinology	3.0		l.		ote: Students interested in Veter	nnary Scho	ooi snould
BIOL	438	Neurobiology	3.0	***************************************	aiso tai	e bic	DL 461 General Microbiology.		
		nt Electives							
BIOL		Plant-Insect Interactions	3.0						
BIOL	443	Conservation Biology	3.0			-			
							DIOI 4202		

Student ID #

	Palament	
DEGREE:	BS	MAJOR REQUIREMENTS FOR A BS DEGREE IN
MAJOR:	BIOL	BIOLOGY: BOTANY
OPTION:	вот	Total credit hours required: 120.0 minimum

REQUIREMENTS AND POLICIES FOR THE BS BIOLOGY MAJOR

A. Policies for Admission to the Major

Student Name:

- 1. New students (freshmen and transfers) must be admitted to the Biology major by the Office of Admissions upon admission to the University.
- 2. Admission of Millersville University students to the Biology major (from other departments or undeclared status) requires that the student is in satisfactory academic standing as described in the Undergraduate catalog. Students who were dropped from a Biology major also must satisfy the Biology Retention in the Major criteria before being readmitted to a Biology major.
- Non-degree and continuing education students must be admitted to the Biology major by the Office of Admissions.

B. Policies for Retention in the Major

- 1. University requirements for retention must be met.
- 2. All Biology majors must earn grades of C- (C minus) or higher in all core courses (BIOL 101, 211, 221, 343, 362, 364) required for their option.
- 3. The requirements stated above must be satisfied before completion of 90 Millersville University credit hours.
- 4. Millersville University students changing majors, or Biology majors changing options within the Biology major, must satisfy the above requirements prior to completion of 45 additional Millersville University credit hours. Note: Students who desire to change their major to Biology must refer to the Biology department's Admission to the Major Policy. Those transferring into the major may substitute BIOL 100 for BIOL 101 if they earn a grade of B- (B minus) or higher in this course.
- 5. Transfer students with 60 credit hours or more must satisfy the above requirements prior to completion of 45 Millersville University credit hours. Transfer students with fewer than 60 credits should refer to the policy for all other majors (part 3 above).
- 6. Any students failing to meet the above requirements will be dropped from the Biology major. Students who wish to re-enter the major, must follow the requirements stipulated in part 4 above.

C. Policies for Completion of the Major

- 1. Completion of all University curricular requirements.
- 2. ENGL 312, Technical Writing, is the recommended course for the Upper Level Writing Requirement under the General Education Curriculum Requirements.

Major: BS BIOLOGY Option: BOTANY

Major Field Requirements: **45.0 credits** Other Requirements: **35.0-39.0credits**

Course No	D.	Short little	C.H.	Grade	Course No	ο,	Short little	C.H.	Grade
REQUIRED BIOLOGY COURSES (24.0 credits)					REQUIRED RELATED (35.0 - 39.0 credits)				
DIOL 101 Foundations of Distance 10					Chemistry (20.0 credits)				
BIOL		Foundations of Biology	4.0		CHEM	111*	Intro Chemistry I	4.0	
BIOL		Concepts of Zoology	4.0		CHEM	112*	Intro Chemistry II	4.0	
BIOL		Concepts of Botany	4.0		CHEM	231*	Organic Chemistry I	4.0	
BIOL		Ecology & Evolution	4.0				Organic Chemistry II	4.0	
BIOL	362	Cell & Development	4.0				Biochemistry I	4.0	
BIOL	364	Genetics & Mol. Biology	4.0				•		
REQUI	IRED	BOTANY COURSES (10.0-11	.0 credit	:s)			i C- or better in these CH leting CHEM 232.	EM courses	
BIOL		Plant Systematics	3.0	,					
BIOL		Develop Plant Biology	3.0		Note: T	hose	wishing to complete a C	hemistry mino	r
					must co	omple	te CHEM 265 (Quantitat	ive Analysis) i	n
BIOL		Plant Physiology	3.0				ose CHEM courses liste		
BIOL	4/0	AND							
BIOL	472	Biology Colloquium	1.0-2.0	—					
		Seminar in Biology	1.0-2.0		Mathe	matic	s & Computer Science	(7.0-9.0 credi	ts)
BIOI O	GY F	LECTIVES (10.0-11.0 credits	· ·		MATH	161	Calculus I	4.0	
		on with your advisor, choose a		COLUTEDE		4.0.0	OF		
		vel or higher and approved for			MATH	163	Honors Calculus	5.0	
			the piot	gy ma-			AND		
lor to p	ring to	otal biology credits to 45.0.			MATH*	•		<u></u>	
BIOL_							OF		
BIOL_					CSCI*			4.0	
BIOL_									
BIOL_	_		***************************************				MATH courses numbered		
BIOL_					CSCI o	ourse	s numbered 140 or abov	e may be use	d to
BIOL					fulfill th	ese re	equirements.		
510									
*Note:	Those	planning to apply to graduate	or profe	ssional	Physic	cs (8.0	0 - 10.0 credits)		
		d inquire about specific admis			PHYS	131	Physics I with Algebra	4.0	
		program of their choice.	olollo roq	ian o	PHYS		· ·		
IIICIIIO	ioi ine	program or their choice.			1 1110	102	Of	4.0	
					DUVE	224		50	
					PHYS		,		
					PHYS	232	Physics II with Calculus	s 5.0	
•						,	General Electives (as n	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
						•	Selieiai Electives (as ili	ecessary)	
1					ļ				

Ctudont I D #

Student Nan	ie	Student I.D.#
DEGREE:	BS	MAJOR REQUIREMENTS FOR A BS DEGREE IN
MAJOR:	BIOL	BIOLOGY: ENVIRONMENTAL BIOLOGY
OPTION:	EBIO	Total credit hours required: 120.0 minimum

REQUIREMENTS AND POLICIES FOR THE BS BIOLOGY MAJOR

A. Policies for Admission to the Major

Chidant Name.

- 1. New students (freshmen and transfers) must be admitted to the Biology major by the Office of Admissions upon admission to the University.
- Admission of Millersville University students to the biology major (from other departments or undeclared status) requires that the student is in satisfactory academic standing as described inthe Undergraduate Catalog. Students who were dropped from a Biology major also must satisfy the Biology Retention in the Major criteria before being readmitted to a Biology major.
- 3. Non-degree and continuing education students must be admitted to the Biology major by the Office of Admissions.

B. Policies for Retention in the Major

- 1. University requirements for retention must be met.
- 2. All Biology majors must earn grades of C- (C minus) or higher in all core courses (BIOL 101, 211, 221, 343, 362, 364) required for their option.
- 3. The requirements stated above must be satisfied before completion of 90 Millersville University credit hours.
- 4. Millersville University students changing majors, or Biology majors changing options within the Biology major, must satisfy the above requirements prior to completion of 45 additional Millersville University credit hours. Note: Students who desire to change their major to Biology must refer to the Biology department's Admission to the Major Policy. Those transferring into the major may substitute BIOL 100 for BIOL 101 if they earn a grade of B-(B minus) or higher in this course.
- 5. Transfer students with 60 credit hours or more must satisfy the above requirements prior to completion of 45 Millersville University credit hours. Transfer students with fewer than 60 credits should refer to the Biology department's Admission to the Major Policy.
- 6. Any students failing to meet the above requirements will be dropped from the Biology major. Students who wish to re-enter the major, must follow the requirements stipulated in part 4 above.

C. Policies for Completion of the Major

- 1. Completion of all University curricular requirements.
- 2. ENGL 312, Technical Writing, is the recommended course for the Upper Level Writing Requirement under the General Education Curriculum Requirements.

Course No.

Major: BS BIOLOGY

Course No.

Option: ENVIRONMENTAL BIOLOGY Major Field Requirements: 46.0 credits

Short Title

When applicable, up to six of the REQUIRED RELATED courses may be credited toward the Liberal Arts Core subject to normal distribution rules.

C.H.

Grade

Other Requirements: 37.0 - 40.0 credits Short Title

Grade

C.H.

				1				
R	EQUI	RED BIOLOGY COURSES (24	4.0 credits)		REQ	UIRED RELATED (37.0 - 40.0 c	credits)	
BIOL	101	Foundations of Biology	4.0	Chemi	stry (16.0 credits)		
BIOL	211	——————————————————————————————————————	4.0			Introductory Chemistry I	4.0	
BIOL	221	Concepts of Botany	4.0			Introductory Chemistry II	4.0	
BIOL	343	•	4.0				4.0	
BIOL	362	Cell & Development	4.0			Short Course Organic Chemistry		
BIOL	364	•	4.0 4.0 4.0 4.0 4.0			Environmental Chemistry I & Lab	4.0	
				NOTE: (231* and CHEM 232 (total 8.0 credits	s) may sub	stitute
		ENV BIOL COURSES (7.0-8.0	•	*Must ea	arn a C	or better in these courses before co	mpleting (CHEM
BIOL		Population Community Ecology	3.0	235 or 2	32.		, -	
BIOL		Ecosystems	3.0					
BIOL	472	Seminar (Env. Biology)	1.0-2.0	Mathe	matics	s (4.0 - 5.0 credits)		
						Calculus for Management	4.0	*****
		ELECTIVES in Adv. Ecology	(6.0 credits)	OR				
Select		f the following courses:		MATH OR	161	Calculus I	4.0	
BIOL		Plant Systematics*	3.0	MATH	163	Honors Calculus	5.0	
BIOL		Plant/Insect Interactions	3.0			· · · · · · · · · · · · · · · · · · ·		
BIOL		Wildlife Ecology & Management	3.0	AND				
BIOL		Conservation Biology	3.0	PIO:	07F4	Diameter	0.0	
BIOL		Aquatic Biology	3.0	BIOL	3/5"	Biometry	3.0	***************************************
BIOL	486	Behavioral Ecology	3.0	OR	005	Commence of Otationia	0.0	
NOTE:	P!O	L 325 is recommended.		MATH	235	Survey of Statistics	3.0	_
NO IE.	BIO	L 323 is reconsiliented.		*NOTE:	Biom	etry is recommended.		
Organ	ismal	l Biology (3.0-4.0 credits)		Dh	. /0.0	credits)		
5		- Diology (old ile bloamb)		Physic	S (8.U	credits)		
In cons		n with your advisor, choose one co		PHYS	•	Physics I with Algebra	4.0	
In cons		,		1 -	131	Physics I with Algebra	4.0 4.0	
In cons followir	ıg: Bl0	n with your advisor, choose one co OL 346, 396, 415, 416, 417, 418, 4		PHYS	131	•		_
In cons followir	ıg: Bl0	n with your advisor, choose one co		PHYS PHYS	131 132	Physics I with Algebra Physics II with Algebra OR		
In cons followin	ng: BIC	n with your advisor, choose one co OL 346, 396, 415, 416, 417, 418, 4	24, 461. 	PHYS	131 132 231	Physics I with Algebra Physics II with Algebra	4.0	
In cons followin BIOL Practic Choose must in	cal Ex one o	n with your advisor, choose one co OL 346, 396, 415, 416, 417, 418, 4 Experience in Env. Biology (1.0 of the following for a minimum of 1.0 research approved by advisor, and	24, 461. 9-3.0 credits) 0 credit. Co-op	PHYS PHYS PHYS PHYS NOTE:	131 132 231 232 Some	Physics I with Algebra Physics II with Algebra OR Physics I with Calculus	4.0 5.0 5.0	and
In cons followir BIOL Praction Choose must internsh	cal Ex one o	n with your advisor, choose one co OL 346, 396, 415, 416, 417, 418, 4 experience in Env. Biology (1.0) of the following for a minimum of 1.1 research approved by advisor, and if scientific research papers.	24, 461. 9-3.0 credits) 0 credit. Co-op result in co-op/	PHYS PHYS PHYS PHYS NOTE: 232 (Ph	131 132 231 232 Some	Physics I with Algebra Physics II with Algebra OR Physics I with Calculus Physics II with Calculus graduate programs may require P	4.0 5.0 5.0	and
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Student	Name:	Student I.D.#
DEGREE:	BS	MAJOR REQUIREMENTS FOR A BS DEGREE IN
MAJOR:	BIOL	BIOLOGY: MARINE BIOLOGY
OPTION:	MAR	Total credit hours required: 120.0 minimum

REQUIREMENTS AND POLICIES FOR THE BS BIOLOGY MAJOR

A. Policies for Admission to the Major

- 1. New students (freshmen and transfers) must be admitted to the Biology major by the Office of Admissions upon admission to the University.
- 2. Admission of Millersville University students to the Biology major (from other departments or undeclared status) requires that the student is in satisfactory academic standing as described in the Undergraduate Catalog. Students who were dropped from a Biology major also must satisfy the Biology Retention in the Major criteria before being readmitted to a Biology major.
- 3. Non-degree and continuing education students must be admitted to the Biology major by the Office of Admissions.

B. Policies for Retention in the Major

- 1. University requirements for retention must be met.
- 2. All Biology majors must earn grades of C- (C minus) or higher in all core courses (BIOL 101, 211, 221, 343, 362, 364) required for their option.
- 3. The requirements stated above must be satisfied before completion of 90 Millersville University credit hours.
- 4. Millersville University students changing majors, or Biology majors changing options within the Biology major, must satisfy the above requirements prior to completion of 45 additional Millersville University credit hours. Note: Students who desire to change their major to Biology must refer to the Biology department's Admission to the Major Policy. Those transferring into the major may substitute BIOL 100 for BIOL 101 if they earn a grade of B- (B minus) or higher in this course.
- 5. Transfer students with 60 credit hours or more must satisfy the above requirements prior to completion of 45 Millersville University credit hours. Transfer students with fewer than 60 credits should refer to the policy for all other majors (part #3 above).
- 6. Any student failing to meet the above requirements will be dropped from the Biology major. Students who wish to re-enter the major, must follow the requirements stipulated in part 4 above.

C. Policies for Completion of the Major

- 1. Completion of all University curricular requirements.
- 2. ENGL 312, Technical Writing, is the recommended course for the Upper Level Writing Requirement under the General Education Curriculum Requirements.

Major: BS BIOLOGY
Option: MARINE BIOLOGY

Major Field Requirements: **47.0 credits** Other Requirements: **31.0 - 35.0 credits**

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Course N		Short Title				Grade
R	EQUIR	ED BIOLOGY COURSES (24.0	credits	5)	REQUIRED RELATED (31.0 - 35.0 credits)	
BIOL	101	Foundations of Biology	4.0		Chemistry & Earth Sciences (19.0-20.0 credits)	
BIOL	211	Concepts of Zoology	4.0		ESCI 261 Intro to Oceanography 4.0	
BIOL	221	Concepts of Botany	4.0		CHEM 111* Introductory Chemistry I 4.0 _ CHEM 112* Introductory Chemistry II 4.0 _	
BIOL	343	Ecology and Evolution	4.0		CHEM 235 Short Course Organic Chemistry 4.0	
BIOL	362	Cell & Development	4.0		AND	
BIOL	364	Genetics & Molecular Biology	4.0		CHEM 375 Environmental Chemistry 4.0	
					or	
REQUI	RED MA	ARINE BIOLOGY COURSES (17.	0-18.0 c	redits)	ESCI 363 Chemical Oceanography 3.0	
BIOL	291	Marine Biology	4.0	,	Note: CHEM 231* and CHEM 232 (total of 8.0 credits)	、
OR	201	Wallie Diology	7.0		may substitute for CHEM 235.	'
BIOL	290	Coastal Marine Biology *	3.0			
and					*Must earn a C- or better in these courses before com	} -
BIOL	292	Problem Solving Marine Biol *	1.0		pleting CHEM 235 or 231.	
		_				
BIOL	295	Marine Invertebrates	3.0		Mathematics (4.0 - 5.0 credits)	
BIOL	375	Biometry	3.0	<u> </u>		
BIOL	396	Ichthyology	3.0 1.0-2.0	^	MATH 151 Calculus for Mgmt, Life & SS 4.0 _	
BIOL BIOL	472 495/	Marine Biology Seminar Biological Oceanography	3.0	·	OR	
ESCI	465	Biological Oceanography	0.0		MATH 161 Calculus I 4.0 _	—
1.00	700				MATH 163 Honors Calculus 5.0	
					_	
					Physics (8.0-10.0 credits)	
BIOL O	GY FLI	ECTIVES (5.0-6.0 credits)			PHYS 131 Physics I with Algebra 4.0	
1					PHYS 132 Physics II with Algebra 4.0	
		with your advisor, chooose add		101	OR	
		300-level or higher and approve total BIOL credits to 47.	iu iui bi	IOL	PHYS 231 Physics I with Calculus 5.0	
1	ט מוווע	total BIOL credits to 47.			PHYS 232 Physics II with Calculus 5.0	
BIOL						
BIOL	 .				Note: Students are encouraged to consider completing	_
BIOL					a minor in Oceanography and, in consultation with the	
					advisor, to take further courses in mathematics.	-"
FIELD	COURS	SES				
At least	t 2 cour	ses (6 credits) of a student's bio	logy			
		red marine biology courses or bi			General Electives (as necessary)	
elective	es) mus	t be taken at a marine field statio	on.		General Electives (as necessary)	
						1

Student Name:	Student I.D.#

DEGREE:

BS

MAJOR REQUIREMENTS FOR A BS DEGREE IN

BIOLOGY: MEDICAL TECHNOLOGY

MAJOR: OPTION:

BIOL MEDT

Total credit hours required: 120.0 minimum

REQUIREMENTS AND POLICIES FOR THE BS BIOLOGY MAJOR

A. Policies for Admission to the Major

- 1. New students (freshmen and transfers) must be admitted to the Biology major by the Office of Admissions upon admission to the University.
- 2. Admission of Millersville University students to the Biology major (from other departments or undeclared status) requires that the student is in satisfactory academic standing as described in the Undergraduate Catalog. Students who were dropped from a Biology major also must satisfy the Biology Retention in the Major criteria before being readmitted to a Biology major.
- Non-degree and continuing education students must be admitted to the Biology major by the Office of Admissions.

B. Policies for Retention in the Major

- 1. University requirements for retention must be met.
- 2. All Biology majors must earn grades of C- (C minus) or higher in all core courses (BIOL 101, 211, 362, 364) required for their option.
- 3. The requirements stated above must be satisfied before completion of 90 Millersville University credit hours.
- 4. Millersville University students changing majors, or Biology majors changing options within the Biology major, must satisfy the above requirements prior to completion of 45 additional Millersville University credit hours. Note: Students who desire to change their major to Biology must refer to the Biology department's Admission to the Major Policy. Those transferring into the major may substitute BIOL 100 for BIOL 101 if they earn a grade of B- (B minus) or higher in this course.
- 5. Transfer students with 60 credit hours or more must satisfy the above requirements prior to completion of 45 Millersville University credit hours. Transfer students with fewer than 60 credits should refer to the policy for all other majors (part #3 above).
- 6. Any students failing to meet the above requirements will be dropped from the Biology major. Students who wish to re-enter the major, must follow the requirements stipulated in part 4 above.

C. Policies for Completion of the Major

- 1. Completion of all University curricular requirements.
- 2. Degree will be awarded after student has successfully completed a year of clinical education at an approved Medical Technology school.
- 3. ENGL 312, Technical Writing, is the recommended course for the Upper Level Writing Requirement under the General Education Curruculum Requirements.

D. Admission to the clinical program is competitive and is not guaranteed.

Major: BS BIOLOGY Option: MEDICAL TECHNOLOGY (Clinical Labratory Science) Major Field Requirements: 60.0 credits Other Requirements: 24.0-25.0 credits	When applicable, up to six of the REQUIRED RELATED courses may be credited toward the Liberal Arts Core subject to normal distribution rules.
Course No. Short Title C.H. Grade Q.P.	Course No. Short Title C.H. Grade Q.P.
REQUIRED BIOLOGY COURSES (16.0 credits) BIOL 101 Foundations of Biology 4.0 BIOL 211 Concepts of Zoology 4.0 BIOL 362 Cell & Development 4.0 BIOL 364 Genetics & Mol. Biology 4.0 REQUIRED MEDICAL TECH COURSES (6.0 credits) BIOL 257 Intro to Allied Health 1.0 BIOL 454 Immunology 2.0 BIOL 461 General Microbiology 3.0 BIOL 356 or 254 & 255; and BIOL 375 are strongly recommended. BIOL BIOL 556 or 254 & 255; and BIOL 375 are strongly recommended. BIOL 510 EDUCATION (30.0 credits) BIOL 510 EDUCATION (30.0 credits) Upon completion of one year of Clinical Laboratory Science education at an affiliated hospital site, 30.0 credit hours will be credited toward the B.S. degree in Biology with the Medical Technology (Clinical Laboratory Science) option. Clinical Laboratory Science Courses (30 credits)	Course No. Short Title C.H. Grade Q.P. REQUIRED RELATED (24.0-25.0 credits) Chemistry (16.0 credits) CHEM 111* Intro to Chemistry I 4.0 CHEM 112* Intro to Chemistry II 4.0 CHEM 326 Short Course Org. Chem 4.0 CHEM 326 Biochemistry I 4.0 Note: CHEM 231* and CHEM 232 (total 8.0 credits) may substitute for CHEM 235. * Must earn a C- or better in these CHEM courses before completing CHEM 235 or CHEM 232. Note: Those wishing to complete a Chemistry Minor must complete CHEM 265 (Quantitative Analysis) in addition to those Chemistry courses listed above. Note: Students who are considering going to graduate school or attending medical, dental, veterinary school or wanting to enroll in school to become a pharmacist, physical therapist, or physician assistant after completing their clinical training SHOULD TAKE CHEM 231 and 232. Mathematics (4.0 - 5.0 credits) MATH 160 Precalculus 4.0 ———————————————————————————————————

Student Name:		Student I.D.#
DEGREE: MAJOR:	BS BIOL	MAJOR REQUIREMENTS FOR A BS DEGREE IN BIOLOGY: MOLECULAR/BIOTECHNOLOGY
OPTION:	MOL	Total credit hours required: 120,0 minimum

REQUIREMENTS AND POLICIES FOR THE BS BIOLOGY MAJOR

A. Policies for Admission to the Major

- 1. New students (freshmen and transfers) must be admitted to the Biology major by the Office of Admissions upon admission to the University.
- 2. Admission of Millersville University students to the Biology major (from other departments or undeclared status) requires that the student is in satisfactory academic standing as described in the Undergraduate Catalog. Students who were dropped from a Biology major must satisfy the Biology Retention in the Major criteria before being readmitted to a Biology major.
- Non-degree and continuing education students must be admitted to the Biology major by the Office of Admissions.

B. Policies for Retention in the Major

- 1. University requirements for retention must be met.
- 2. All Biology majors must earn grades of C- (C minus) or higher in all core courses (BIOL 101, 211, 221, 343, 362, 364) required for their option.
- 3. The requirements stated above must be satisfied before completion of 90 Millersville University credit hours.
- 4. Millersville University students changing majors, or Biology majors changing options within the Biology major, must satisfy the above requirements prior to completion of 45 additional Millersville University credit hours. Note: Students who desire to change their major to Biology must refer to the Biology department's Admission to the Major Policy. Those transferring into the major may substitute BIOL 100 for BIOL 101 if they earn a grade of B- (B minus) or higher in this course.
- Transfer students with 60 credit hours or more must satisfy the above requirements prior to completion of 45 Millersville University credit hours. Transfer students with fewer than 60 credits should refer to the policy for all other majors (part #3 above).
- 6. Any students failing to meet the above requirements will be dropped from the Biology major. Students who wish to re-enter the major, must follow the requirements stipulated in part 4 above.

C. Policies for Completion of the Major

- 1. Completion of all University curricular requirements.
- ENGL 312, Technical Writing, is the recommended course for the Upper Level Writing Requirement under the General Education Curriculum Requirements.

Major: BS BIOLOGY

Optior Major	ı: MO l Field	NOLOGY LECULAR/BIOTECHN Requirements: 39.0 cre irements: 39.0-43.0 cre	dits	1		courses	may	able, up to six of the R be credited toward th tribution rules.			
Course N	0.	Short Title	C.H.	Grade	Q.P.	Course No.		Short Title	C.H.	Grade	Q.P.
REQUI	RED I	BIOLOGY COURSES (24.0 cr	edits)			REQ	UIRED RELATED (39	.0-43.0	credits)	
BIOL BIOL BIOL BIOL BIOL BIOL REQUI	211 221 343 362 364 RED	Foundations of Biology Concepts of Zoology Concepts of Botany Ecology & Evolution Cell & Development Genetics & Mol. Biology MOL/BIOLTECH COUR Molecular Biology	4.0 4.0 4.0 4.0 4.0	B.0-9.0	credits)	CHEM CHEM CHEM CHEM CHEM BIOL/CH	111* 112* 231* 232 326* 327	24.0 credits) Intro to Chemistry I Intro to Chemistry II Organic Chemistry II Organic Chemistry II *Biochemistry IAND Biochemistry IIOR Plant Biochemistry	4.0 4.0 4.0 4.0 4.0 4.0		
BIOL BIOL	466		3.0			complet	ing C	dent may complete a l HEM 328 (Analytical	Biochem Biochem	istry Lat	oratory)
		ECTIVES (6.0-7.0 cred	•	Iditiona	Lagurage	may cor	nplet	all the above Chemis e a Chemistry minor b Analysis) in addition t	y compl	eting CH	IEM 265
at the 3	00-le total	vel or higher and approv BIOL credits to 39. The	ed for	BIOL m	najors	ing CHE	arn a M 23 earn	C- or better in these of 32. a C- or better in CHE			,
BIOL						Mathem	atics	& Computer Science	e (7.0 -	9.0 cred	its)
BIOL BIOL			_			MATH		Calculus I	4.0		
						MATH	163	Honors Calculus	5.0		
						MATH*		or	4.0		
						CSCI co	urses	1ATH courses numbers numbered 140 or ab quirements.			
						Physics	(8.0	- 10.0 credits)			
								Physics I with Algebra Physics II with Algebra or			_
								Phys I with Calculus Phys II with Calculus			
						Genera	l Ele	ctives (As necessary	') 		

Student Name: Student I.D.#_	
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DEGREE:

BS

MAJOR REQUIREMENTS FOR A BS DEGREE IN BIOLOGY: NUCLEAR MEDICINE TECHNOLOGY

MAJOR: OPTION:

BIOL

NUCM

Total credit hours required: 120.0 minimum

REQUIREMENTS AND POLICIES FOR THE BS BIOLOGY MAJOR

A. Policies for Admission to the Major

- 1. New students (freshmen and transfers) must be admitted to the Biology major by the Office of Admissions upon admission to the University.
- 2. Admission of Millersville University students to the Biology major (from other departments or undeclared status) requires that the student is in satisfactory academic standing as described in the Undergraduate Catalog. Students who were dropped from a Biology major also must satisfy the Biology Retention in the Major criteria before being readmitted to a Biology major.
- 3. Non-degree and continuing education students must be admitted to the Biology major by the Office of Admissions.

B. Policies for Retention in the Major

- 1. University requirements for retention must be met.
- 2. All Biology majors must earn grades of C- (C minus) or higher in all core courses (BIOL 101, 211, 362, 364) required for their option.
- 3. The requirements stated above must be satisfied before completion of 90 Millersville University credit hours.
- 4. Millersville University students changing majors, or Biology majors changing options within the Biology major, must satisfy the above requirements prior to completion of 45 additional Millersville University credit hours. Note: Students who desire to change their major to Biology must refer to the Biology department's Admission to the Major Policy. Those transferring into the major may substitute BIOL 100 for BIOL 101 if they earn a grade of B- (B minus) or higher in this course.
- Transfer students with 60 credit hours or more must satisfy the above requirements prior to completion of 45 Millersville University credit hours. Transfer students with fewer than 60 credits should refer to the policy for all other majors (part #3 above).
- 6. Any students failing to meet the above requirements will be dropped from the Biology major.

 Students who wish to re-enter the major, must follow the requirements stipulated in part 4 above.

C. Policies for Completion of the Major

- 1. Completion of all University curricular requirements.
- 2. ENGL 312, Technical Writing, is the recommended course for the Upper Level Writing Requirement under the General Education Curriculum Requirements.
- D. Admission to the clinical program is competitive and is not guaranteed.

When applicable, up to six of the REQUIRED RELATED

Major: BS BIOLOGY

Option: NUCLEAR MEDICINE TECHNOLOGY courses may be credited toward the Liberal Arts Core subject Major Field Requirements: 53.0 credits to normal distribution rules. Other Requirements: 28.0 - 31.0 credits Course No. Short Title C.H. Q.P. Course No. Short Title C.H. Grade Q.P. Grade REQUIRED BIOLOGY COURSES (16.0 credits) REQUIRED RELATED (28.0 - 31.0 credits) 101 Foundations of Biology 4.0 Chemistry (16.0 credits) BIOL 211 Concepts of Zoology 4.0 CHEM 111* Intro to Chemistry I BIOL 362 Cell & Development 4.0 BIOL 364 Genetics & Mol. Biology 4.0 CHEM 112* Intro to Chemistry II 4.0 CHEM 235 Short Course Org Chem4.0 REQUIRED NUC. MED. COURSES (9.0 credits) CHEM 326 Biochemistry I BIOL 257 Intro to Allied Health Note: CHEM 231* and CHEM 232 (total 8.0 credits) may BIOL 356 Functional Human Anat 5.0 substitute for CHEM 235. BIOL 375 Biometry 3.0 * Must earn a C- or better in these CHEM courses before **NUCLEAR MED CLINICAL EDUCATION (28.0 credits)** completing CHEM 235 or 232. Upon completion of one year at the Lancaster General Note: Those wishing to complete a Chemistry minor must Hospital College of Nursing and Allied Health, 28.0 credit complete CHEM 265 (Quantitative Analysis) in addition to hours will be credited toward the B.S. degree in Biology those CHEM courses listed. with the Nuclear Medicine Technology option. Note: Students who are considering going to graduate school or attending medical, dental, veterinary school or Lancaster General Hospital College of Nursing and wanting to enroll in school to become a pharmacist, physical Allied Health 28.0 credits therapist, or physician assistant after completing their clinical training SHOULD ALSO TAKE CHEM 231 and 232. Mathematics (4.0 - 5.0 credits) MATH 160 Precalculus 4.0 ---- Oľ ---- ----MATH 161 Calculus I 4.0 ---- or ----MATH 163 Honors Calculus 5.0 Note: Students who are considering going to graduate school or professional school after their clinical program SHOULD TAKE MATH 161. Physics (8.0 - 10.0 credits) PHYS 131 Physics I with Algebra 4.0 PHYS 132 Physics II with Algebra 4.0 ---- ---- O[---- ----PHYS 231 Physics I with Calculus 5.0 PHYS 232 Physics II with Calculus 5.0 General Electives (as necessary)

Student Name:	 Student I.D.#	_

DEGREE:

BS

MAJOR REQUIREMENTS FOR A BS DEGREE IN

BIOLOGY: PRE-OPTOMETRY

MAJOR: OPTION:

BIOL POPT

Total credit hours required: 120.0 minimum

REQUIREMENTS AND POLICIES FOR THE BS BIOLOGY MAJOR

A. Policies for Admission to the Major

- 1. New students (freshmen and transfers) must be admitted to the Biology major by the Office of Admissions upon admission to the University.
- 2. Admission of Millersville University students to the biology major (from other departments or undeclared status) requires that the student is in satisfactory academic standing as described in the Undergraduate Catalog. Students who were dropped from a Biology major also must satisfy the Biology Retention in the Major criteria before being readmitted to a Biology major.
- Non-degree and continuing education students must be admitted to the Biology major by the Office of Admissions.

B. Policies for Retention in the Major

- 1. University requirements for retention must be met.
- 2. All Biology majors must earn grades of C- (C minus) or higher in all core courses (BIOL 101, 211, 362, 364) required for their option.
- 3. The requirements stated above must be satisfied before completion of 90 Millersville University credit hours.
- 4. Millersville University students changing majors, or Biology majors changing options within the Biology major, must satisfy the above requirements prior to completion of 45 additional Millersville University credit hours. Note: Students who desire to change their major to Biology must refer to the Biology department's Admission to the Major Policy. Those transferring into the major may substitute BIOL 100 for BIOL 101 if they earn a grade of B- (B minus) or higher in this course.
- 5. Transfer students with 60 credit hours or more must satisfy the above requirements prior to completion of 45 Millersville University credit hours. Transfer students with fewer than 60 credits should refer to the policy for all other majors (part #3 above).
- 6. Any students failing to meet the above requirements will be dropped from the Biology major. Students who wish to re-enter the major, must follow the requirements stipulated in part 4 above.

C. Policies for Completion of the Major

- 1. Completion of all University curricular requirements.
- 2. ENGL 312, Technical Writing, is the recommended course for the Upper Level Writing Requirement under the General Education Curriculum Requirements.
- D. Admission to the Pennsylvania College of Optometry at Salus University is competitive and is not guaranteed.

Major: BS BIOLOGY
Option: PRE-OPTOMETRY

Major Field Requirements: **46.0-47.0 credits**Other Requirements: **35.0-39.0 credits**

Course N	lo.	Short Title C	.Н.	Grade	Q.P.	Course N	o.	Short Title	C.H.	Grade	Q.P.
REQU	IRED I	BIOLOGY COURSES (1	6.0 c	redits)			RE	QUIRED RELATED (35.0-39.0	credits)	Ì
BIOL		Foundations of Biology				Chemis	stry (20.0 credits)			l
BIOL		Concepts of Zoology	4.0					Intro to Chemistry I	4.0		
BIOL		Cell & Development	4.0	***************************************		CHEM	112*	Intro to Chemistry II	4.0		
BIOL	364	Genetics & Mol. Biology	/ 4.0					Organic Chemistry I			
REQUI	RED P	RE-OPTOMETRY COUR	SES	(7.0-8.0 c	redits)			Organic Chemistry I			
BIOL	375	Biometry	3.0			CHEM	326	Biochemistry I	4.0		
BIOL	461	General Microbiology	3.0					C- or better in these	CHEM c	ourses be	efore
BIOL	472	Seminar in Biology	1.0-2	2.0	-			CHEM 232			
						L		wishing to complete		-	
OPTO	METR	Y CLINICAL EDUCATIO	N (23	3.0 credit	s)			IEM 265 (Quantitative	e Analysis	s) in addit	ion to
		etion of one year at the P				1		stry courses listed.			_
		at Salus University, 23.0				Mather	natic	s & Computer Scien	ice (7.0 -	9.0 credi	its)
credite	d towa	ard the B.S. degree in Bi	ology	with the	Pre-	MATH	161	Calculus I	4.0		
Optom	etry O	ption.						or			
Penns	ylvania	a College of Optometry a	t Salu	ıs Univer	sity	MATH	163	Honors Calculus	5.0		
		23.0 credits		1				AND			
		20.0 0160118	<u> </u>	l		MATH*		·-			
							•	or			
1						CSCI*		BAATIL management			
								MATH courses numbered 140 or a			
								ements.	ADOVE ITIE	iy De use	a to rumn
						l .	•	0 - 10.0 credits)			
						_	-	Physics I with Algebi	ra 4.0		
						ľ		Physics I with Algeb			
						11113	102	Friyaica ii willi Algen	na 1 .0		
						PHYS	231	Physics I with Calcul	lus 5.0		
						1		Physics II with Calcu			
								•			
						Recom	men	ded Psychology Co	urse (G3)	
						PSYC	100	General Psychology	3.0		
						*Note:	PSYC	2 100 will count towar	ds the G	3 general	educa-
						tion red	luiren	nent.			
								-			
								General Electives (a	s neces	sarv)	
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1						1					

Student Name:	Student I.D.#

DEGREE:

BS

MAJOR REQUIREMENTS FOR A BS DEGREE IN

BIOLOGY: PRE-PODIATRY

MAJOR: OPTION:

BIOL PPOD

Total credit hours required: 120.0 minimum

REQUIREMENTS AND POLICIES FOR THE BS BIOLOGY MAJOR

A. Policies for Admission to the Major

- 1. New students (freshmen and transfers) must be admitted to the Biology major by the Office of Admissions upon admission to the University.
- 2. Admission of Millersville University students to the biology major (from other departments or undeclared status) requires that the student is in satisfactory academic standing as described in the Undergraduate Catalog. Students who were dropped from a Biology major also must satisfy the Biology Retention in the Major criteria before being readmitted to a Blology major.
- Non-degree and continuing education students must be admitted to the Biology major by the Office of Admissions.

B. Policies for Retention in the Major

- 1. University requirements for retention must be met.
- 2. All Biology majors must earn grades of C- (C minus) or higher in all core courses (BIOL 101, 211, 362, 364) required for their option.
- 3. The requirements stated above must be satisfied before completion of 90 Millersville University credit hours.
- 4. Millersville University students changing majors, or Biology majors changing options within the Biology major, must satisfy the above requirements prior to completion of 45 additional Millersville University credit hours. Note: Students who desire to change their major to Biology must refer to the Biology department's Admission to the Major Policy. Those transferring into the major may substitute BIOL 100 for BIOL 101 if they earn a grade of B- (B minus) or higher in this course.
- Transfer students with 60 credit hours or more must satisfy the above requirements prior to completion of 45 Millersville University credit hours. Transfer students with fewer than 60 credits should refer to the policy for all other majors (part #3 above).
- 6. Any students failing to meet the above requirements will be dropped from the Biology major. Students who wish to re-enter the major, must follow the requirements stipulated in part 4 above.

C. Policies for Completion of the Major

- 1. Completion of all University curricular requirements.
- 2. ENGL 312, Technical Writing, is the recommended course for the Upper Level Writing Requirement under the General Education Curriculum Requirements.
- D. Admission to the clinical program is competitive and is not guaranteed.

Major: **BS BIOLOGY**Option: **PRE-PODIATRY**Major Field Requirements: **49.0 credits**Other Requirements: **32.0-35.0 credits**

Course No.		Short Title	C.H.	Grade	Q.P.	Course N	D.	Short Title	C.H.	Grade	Q.P.
REQUIRE	D BIO	LOGY COU	RSES (16.0	credits)			REC	UIRED RELATED (3:	2.0-35.0	credits)	
BIOL 21 BIOL 36	1 Co 32 Co	oundations of oncepts of Zo ell & Develop enetics & Mo	ology ment	4.0 4.0 4.0 4.0		CHEM	111* 112*	20.0 credits) Intro to Chemistry I Intro to Chemistry II	4.0 4.0		
BIOL 36 BIOL 36 BIOL 25 BIOL 35 BIOL 43 PODIATE Upon comof Podiate toward the option.	52 Ce 54 Ge D PR 57 Int 56 Fu 55 Ar 2 Y CL ic Medic ic Medic B.S.	ell & Develop	ment I. Biology / COURSE lealth nan Anat ogy CATION (24 r at Temple credit hours ology with the	4.0 4.0 S (9.0 cre 1.0 5.0 3.0 1.0 credits University will be crehe Pre-po	s) College dited diatry	CHEM CHEM CHEM CHEM CHEM * Must complet Note: T complet those C Mathe MATH Physic PHYS PHYS PHYS PHYS PHYS PHYS Recon PSYC PSYC SOCY Note:	112* 231* 232 326 earn a ing C hose te CH chemi 161 163 131 132 231 232 nmen ———— Many	Intro to Chemistry II Organic Chemistry I Organic Chemistry II Biochemistry I a C- or higher in these HEM 232. wishing to complete a IEM 265 (Quantitative stry courses listed.	4.0 4.0 4.0 4.0 CHEM CHEM CHEMIS Analysis 4.0 5.0 ca 4.0 ra 4.0 us 5.0 clus 5.0 clus 5.0 con Cou cology corequires	rses (G3	must tion to
Miles Inc.							····				

Student Name:	Student I.D.#

DEGREE: BS

MAJOR REQUIREMENTS FOR A BS DEGREE IN **BIOLOGY: RESPIRATORY THERAPY**

BIOL MAJOR: OPTION:

RESP

Total credit hours required: 120.0 minimum

REQUIREMENTS AND POLICIES FOR THE BS BIOLOGY MAJOR

A. Policies for Admission to the Major

- 1. New students (freshmen and transfers) must be admitted to the Biology major by the Office of Admissions upon admission to the University.
- 2. Admission of Millersville University students to the biology major (from other departments or undeclared status) requires that the student is in satisfactory academic standing as described in the Undergraduate Catalog, Students who were dropped from a Biology major also must satisfy the Biology Retention in the Major criteria before being readmitted to a Biology major.
- 3. Non-degree and continuing education students must be admitted to the Biology major by the Office of Admissions.

B. Policies for Retention in the Major

- 1. University requirements for retention must be met.
- 2. Admission to the professional phase of the Respiratory Therapy program is competitive and not guaranteed. Biology majors in the Respiratory Therapy option must earn grades of C- (C minus) or higher in all required Biology and required-related courses (BIOL 101, 356, 362, 461; CHEM 111, 112, 235, 326; MATH 161 or 163; PHYS 131 or 231), a satisfactory (S) grade in BIOL 257, and have a minimum GPA of 2.3 in these courses. Students must also maintain an overall GPA of 2.0.
- BS Biology Respiratory Therapy students who meet the minimum math/science GPA of 2.3 can schedule an interview with the admission committee for the professional phase of the Respiratory Therapy program. The committee will assess students on her/his academic performance, letters of recommendation, communication skills, understanding of the profession, maturity, and potential to succeed in the professional phase of the program. Students who score poorly during her/his interview may be denied admission to the professional phase of the program even if she/he has met the minimum math/science GPA requirement. Students denied admission into the professional phase of the program will be advised on how he/she can strengthen her/his credentials for re-application the following year or how she/he can complete the degree requirements for an alternative program. If seats are available in the professional phase of the program, students who have not met the minimum math/science GPA may be interviewed and, if accepted, will be admitted on a probationary basis,
- 4. The requirements stated above must be satisfied before completion of 90 Millersville University credit hours.
- 5. Millersville University students changing majors, or Biology majors changing options within the Biology major, must satisfy the above requirements prior to completion of 45 additional Millersville University credit hours. Note: Students who desire to change their major to Biology may substitute BIOL 100 for BIOL 101 if they earn a grade of B- (B minus) or higher in this course,
- 6. Transfer students with 60 credit hours or more must satisfy the above requirements prior to completion of 45 Millersville University credit hours. Transfer students with fewer than 60 credits should refer to the policy for all other majors (part 4 above).
- 7. Any students failing to meet the above requirements will be dropped from the Biology major. Students who wish to re-enter the major, must follow the requirements stipulated in part 5 above.

C. Policies for Completion of the Major

- 1. Completion of all University curricular requirements.
- 2. ENGL 312, Technical Writing, is the recommended course for the Upper Level Writing Requirement under the General Education Curriculum Requirements.
- D. Admission to the professional phase is competitive and is not guaranteed (see part B above).

Major: BS BIOLOGY
Option: RESPIRATORY THERAPY

Option: RESPIRATORY THERAPY
Major Field Requirements: 53.0 credits
Other Requirements: 24.0-26.0 credits

Course N	lo.	Short Title	C.H.	Grade	Course No.	Short Title	C.H.	Grade
REQU	IRED	BIOLOGY COURSES (12.0 c	redits)		R	EQUIRED RELATED (24.0-	26.0 credits)
BIOL		Foundations of Biology	4.0	-1	Chemistr	y (16.0 credits)		
BIOL		Cell & Development	4.0				4.0	
		Genetics & Molecular Biology			1	1* Introductory Chemistry I2* Introductory Chemistry II	4.0 4.0	
1	IRED I	RESP THER COURSES (9.0 c	•		4	5 Short Course Organic Cl		
BIOL	257	Intro Allied Health Profession				R6 Biochemistry I	4.0	
BIOL	356	Functional Human Anatomy	5.0		1	EM 231* and CHEM 232 (total) may
BIOL	461	General Microbiology	3.0		1	for CHEM 235.	ai o.o ci cuita) iliay
		PROFESSIONAL PHASE I (3)	n a C- or better in these CHE	EM courses t	oefore
· ·	•	ation of 32.0 credit hours of clir ster Regional Medical Center (completing	g CHEM 235 or CHEM 232.		
		32.0 credit hours will be credi			Note: Tho:	se wishing to complete a Ch	emistry mind	or must
		in Biology with the Respiratory				CHEM 265 (Quantitative Ana		
	_	Acute Cardiopulmonary Care	-			mistry courses listed above.		
RESP		Respiratory Care Techniques		***************************************	Note: Stud	lents who are considering go	oina to aradu	ıate
RESP		• •	3.0			attending medical, dental, ve		1
RESP	413	Respiratory Assess & Therap	. 4.0			enroll in school to become		
RESP					cal therapi	st, or physician assistant aft	er completin	g their
RESP	419	• •	2.0		profession	al phase SHOULD TAKE CI	HEM 231 and	d 232.
RESP	420	•	3.0		Mathemat	ics (4.0 - 5.0 credits)		
RESP RESP	421	•				61 Calculus I	4.0	
RESP	422	Pharmacology Infectious Diseases	2.0 2.0		1007111111	or calculus i	4.0	—
RESP	424		2.0		MATH 16	3 Honors Calculus	5.0	
RESP	425				1			
RESP	460		1.0		Physics (4	1.0-5.0 credits)		
RESP	461	Clinical Practicum I	2.0		PHYS 13	B1 Physics I with Algebra	4.0	
		on of the Phase I coursework, the				Of		
		a B.S. degree in Biology, Respirat			PHYS 23	B1 Physics I with Calculus	5.0	
		praduate must complete the Phase oployed and certified as a respirate			Note: St	udents who might be interes	ted in attend	ina
I		PROFESSIONAL PHASE II (-		ı	school or professional scho		•
		completion of 25.0 credit hou		•		fessional phase SHOULD Al		
	_	cat Lancaster Regional Medic			132 OR	PHYS 232.		
		eceive a Respiratory Therapy						
		rmit them to seek employment			Suggeste	d Additional Course (no m	ilnimum)	
therapi		qualifies them to take the cert	ification	exam.	PSYC 10	00 General Psychology	3.0	
BIOL		Nutritional Science	3.0					
1		Tech Aspects Mech Ventilatio				idents who are considering g attending medical, dental, v		
RESP		Respiratory Care Techniques			3	o enroll in school to become	•	
RESP		Clinical Practice II	1.0			oist, or physician assistant a		
RESP		Clinical Practicum II Clinical Practicum III	3.0 10.			nal phase SHOULD ALSO o		
		Respiratory Care Research	2.0			gy (PSYC 100), which can b		
		. To privately care in addators	0		general e	ducation requirement.	•	
						General Electives (as ne	ecessary)	
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Sample Student Schedules

The schedules on the following pages are idealized. Each provides one example of how courses could be scheduled to enable completion of degree requirements within four years (eight semesters). There are certainly alternative schedules that could also achieve this goal. Although included in some of the sample schedules, credit loads above 16 hours per semester are not recommended. Students may want to consider taking winter or summer courses to lighten course loads and improve learning.

The sample schedule marked "highly prepared at admission" is designed for a student who enters Millersville University with a strong background in biology, chemistry and math that allows them to take Chem 111 and Math 161 or 160 during their first semester as a freshman. Schedules marked "less prepared at admission" are designed for students who will benefit by completing prerequisite courses before enrolling in these more advanced science classes.

If you have questions about course scheduling, please contact your academic advisor.

FIRST SEMESTER SECOND SEMESTER			Bachelor of Science in A	Allied Hea	th Technolog	Bachelor of Science in Allied Health Technologies - Medical Technology Option	
In the Chemistry A			SAM	PLE PRO	GRAM (120 s	.h. minimum)	
100 General Biology\$ 3 G3 Social Sciences #1 Intro Chemistry I 4 COMM 100 Fundamentals of S Intro Chemistry I 6 Fundamentals of S Intro Chemistry I 1 Intro Chemistry I 257 Intro to Allied Health 14 Intro Chemistry I Interced Electrice** Intro Chemistry I Interced Electrice** Intro Chemistry I Interced Electrice** Interced Chemistry I		FIRST SEM	ESTER			SECOND SEMESTER	
111† Intro Chemistry I	BIOL	100 General	1 Biology [§]	3	G3	Social Sciences #1	3
110 English Composition 3 MATH 160* Precalculus 257³ Intro to Allied Health 1 WELL 175 Wellness 257³ Intro to Allied Health 1 WELL 175 Wellness TCTAL S.H. 14 NELL 175 Wellness 362 Cell & Devel. Biology, W 4 BIOL 255 Human Anat & Phys I 254 Human Anat & Phys I 4 BIOL 255 Human Anat & Phys I 254 Human Anat & Phys I 4 BIOL 356 Genetics & Moleco Scale Sciences #3 254 Human Anat & Phys I 4 BIOL 356 Human Anat & Phys I Aby Introduced Course Organic Chem 4 G1 Humanities #3.D Humanities #3.D Abort Course Organic Chem 15 AATH 130 Elements of Status Aby Introduced Course (P) 3 BIOL 454 Immunology Abranced Elective** 13 BIOL Advanced Writing Actual Elective** 4 ENGL	CHEM	-	hemistry I	4	COMM	100 Fundamentals of Speech	3
Humanities #1	ENGL	110 English	1 Composition	3	MATH	160* Precalculus	4
257 ^a Intro to Allied Health 1 14 WELL 175 Wellness TOTAL S.H. 14 BIOL 255 Human Anat & Phys I A BIOL 255 Human Anat & Phys I BIOL 255 Human Anat & Phys I BIOL 255 Human Anat & Phys I BIOL 255 Human Anat & Phys I BIOL 255 Human Anat & Phys I 254 Human Anat & Phys I 3 Gill Sciences #2 Genetics & Coganic Chem 4 G3 Social Sciences #3 G1 Humanities #3. D Humanities #3. D MATH 130† Elements of Statist TOTAL S.H. 15 TOTAL S.H. TOTAL S.H. TOTAL S.H. TOTAL S.H. Strenged Elective * * * * * * * * * * * * * * * * * * *	G1	Human	ities #1	3	CHEM	112† Intro Chemistry II	4
TOTAL S.H. 14 FOURTH SEMESTER 362 Cell & Devel. Biology, W 4 BIOL 255 Human Anat & Pholec 254 Human Anat & Phys I 4 BIOL 255 Human Anat & Pholec 254 Human Anat & Phys I 4 BIOL 255 Human Anat & Pholec 254 Human Anat & Phys I 4 BIOL 255 Human Anat & Pholec 255 Human Anat & Phys I 4 BIOL 255 Human Anat & Pholec 254 Human Anat & Phys I 4 BIOL 364 Genetics & Molec 255 Human Anat & Phys I 4 BIOL 364 Genetics & Molec 256 Human Anat & Phys I 3 GI Humanities #3.D All PROZAL S.H. 15 MATH 130† Elements of Sciences #3 All General Microbiology 3 BIOL 454* Immunology All General Elective** 3 GI 454* Immunology Berspectives Course (P) 3 BIOL 454* Immunology All Physics I with Algebra 15-17 TOTAL S.H. TOTAL S.H. AL PROGRAM 15-17 TOTAL S.H. TOTAL S.H.	BIOL	257 ^a Intro to	Allied Health		WELL		8
THIRD SEMESTERFOURTH SEMESTER362 Cell & Devel. Biology, W4BIOL255 Human Anat & Ph254 Human Anat & Phys I4BIOL364 Genetics & Molecc2354 Human Anat & Phys I4G3Social Sciences #22354 Short Course Organic Chem4G3Social Sciences #3. DHumanities #2, W3G1Humanities #3. DHumanities #3, DMATH130† Elements of StatistTOTAL S.H.15TOTAL S.H.FIFTH SEMESTERSIXTH SEMESTER461 General Microbiology3BIOL454* ImmunologyDirected Elective**3BIOL454* ImmunologyDirected Electives Course (P)3BIOLDir Elec*#2 to \geq 6 s.131 Physics I with Algebra4ENGL312 or alt. Advanced WritingCAL PROGRAM15-17TOTAL S.H.TOTAL S.H.CAL PROGRAM26TOTAL S.H.TRANSFER CREDITS26TOTAL S.H.TRANSFER CREDITS26TOTAL S.H.137 Physics I with Algebra as prerequised for DIOL 362 and 364.TOTAL S.H.138 Physics I with Algebra as prerequisite for BIOL 362 and 364.TOTAL S.H.		TOTAL	S.H.	14		TOTAL S.H.	17
362 Cell & Devel. Biology, W 4 BIOL 255 Human Anat & Phys I 254 Human Anat & Phys I 4 BIOL 364 Genetics & Molec 255 Rhuman Anat & Phys I 4 G3 Social Sciences & Molec 255 Short Course Organic Chem 3 G1 Humanities & Molec Humanities #2, W 3 G1 Humanities #3, D Humanities #2, W 15 Humanities #3, D Abut In In In In In In In In In In In In In		THIRD SEN	AESTER			FOURTH SEMESTER	
254 Human Anat & Phys I 4 BIOL 364 Genetics & Molec 235 ⁸ Short Course Organic Chem 4 G3 Social Sciences #2 Humanities #2, W 3 G1 Humanities #3, D Humanities #2, W 3 G1 Humanities #3, D TOTAL S.H. 15 MATH 130† Elements of Statist TOTAL S.H. 15 CHEM 30 Statist A61 General Microbiology 3 BIOL 454* Immunology Directed Elective** 3 G3 Social Sciences #3 General Elective** 3 G3 Social Sciences #3 General Elective** 3 G3 Social Sciences #3 I31 Physics I with Algebra 4 ENGL 312 or alt. Advanced Writing ACTAL S.H. 15-17 TOTAL S.H. TOTAL S.H. TOTAL S.H. ACA PROGRAM 15-17 TOTAL S.H. TOTAL S.H. ACA RANSFER CREDITS 26 Social Sciences #3 ACA RANSFER CREDITS 26 Social Sciences #3 ACA RANSFER CREDITS 26 s	BIOL	362 Cell &	Devel. Biology, W	4	BIOL	255 Human Anat & Phys II	4
Humanities #2, W G3 Social Sciences #2 Humanities #2, W 3 G1 Humanities #3, D Humanities #3, D MATH 130† Elements of Statist TOTAL S.H. 15 SIXTH SEMESTER FIFTH SEMESTER SI BIOL 454* Immunology Directed Elective** 3 G3 Social Sciences #3 General Microbiology 3 BIOL 454* Immunology Directed Elective** 3 G3 Social Sciences #3 General Elective** 15-17 BIOL 312 or alt. Advanced Writing TOTAL S.H. 15-17 Advanced Writing TOTAL S.H. Advanced Writing Total	BIOL	254 Human	Anat & Phys I	4	BIOL	364 Genetics & Molecular Bio	4
Humanities #2, W $\frac{3}{2}$ G1 Humanities #3, D FIRTH SEMESTER 15 TOTAL S.H.	CHEM	235ª	Course Organic Chem	4	63	Social Sciences #2, W	3
TOTAL S.H. 130† Elements of Statist TOTAL S.H. 15 TOTAL S.H. FIFTH SEMESTER SIXTH SEMESTER TOTAL S.H. FIFTH SEMESTER SIXTH SEMESTER TOTAL S.H. Directed Elective* # 1 2-4 CHEM 326 Biochemistry I General Elective* # 3 G3 Social Sciences #3 General Elective* # 3 BIOL Advanced Writing TOTAL S.H. TOTAL S.H. TOTAL S.H. TOTAL S.H. TOTAL S.H. Semester; BIOL 454 offered only in Spring Semester serve as a non-BIOL G2 course / *Can serve as a G2 required if needed to bring overall total to 120 s.h. General Elective* # 15-17 Dir Elec* # 2 to ≥ 6 s. TOTAL S.H. TOTAL S.H. TOTAL S.H. TOTAL S.H. TAL S.H. TOTAL S.H.	<u>G1</u>		ities #2, W	ωl	GI		33
FIFTH SEMESTER IS TOTAL S.H. 461 General Microbiology 3 BIOL 454ª Immunology 461 General Microbiology 3 BIOL 454ª Immunology Actorial Microbiology 3 BIOL 456 Biochemistry I General Elective** 3 G3 Social Sciences #3 Perspectives Course (P) 3 BIOL Dir Elec*#2 to ≥ 6 s. 131 Physics I with Algebra 4 ENGL 312 or alt. Advanced Writing 7OTAL S.H. 15-17 7OTAL S.H. 7OTAL S.H. Actorial Elective** 26 7OTAL S.H. Actorial Elective** 26 7OTAL S.H. Actorial Elective** 26 7OTAL S.H. Actorial Chem 23s offered only in Fall Semester; BIOL 454 offered only in Spring Semester; BIOL 454 offered only in Spring Semester; BIOL 454 offered only in G2 course / *Can serve as a G2 required MATH course Actorial in eeded to bring overall total to 120 s.h. Actorial Schrift All Semester			Manadada - Aldard Alemania and		MATH		æl.
FIFTH SEMESTER SIXTH SEMESTER 461 General Microbiology 3 BIOL 454ª Immunology Directed Elective № #1 2-4 CHEM 326 Biochemistry I General Elective № #1 2-4 CHEM 326 Biochemistry I General Elective № #1 2-4 CHEM 326 Biochemistry I Brospectives Course (P) 3 BIOL Dir Elec № #2 to ≥ 6 s. 131 Physics I with Algebra 4 ENGL 312 or alt. Advanced Writing 131 Physics I with Algebra 15-17 TOTAL S.H. TOTAL S.H. CAL PROGRAM 15-17 TOTAL S.H. TOTAL S.H. CAL PROGRAM 26 TOTAL S.H. TOTAL S.H. Action CHEM 235 offered only in Fall Semester; BIOL 454 offered only in Spring Semester Serve as a non-BIOL G2 course / *Can serve as a G2 required MATH course Action as a non-BIOL G2 course / *Can serve as a G2 required if needed to bring overall total to 120 s.h. Advanced only in Spring Semester		TOTAL	. S.H.	15		TOTAL S.H.	17
FIFTH SEMESTERSIXTH SEMESTER461 General Microbiology3BIOL 454^a Immunology— Directed Elective**3G3Social Sciences #3— General Elective**3G3Social Sciences #3— Perspectives Course (P)3BIOLDir Elec** #2 to ≥ 6 s.131 Physics I with Algebra4ENGL312 or alt. Advanced WritingTOTAL S.H. $15-17$ $707AL$ S.H.CAL PROGRAM 26 $707AL$ S.H.TRANSFER CREDITS 26 $707AL$ S.H.257 and CHEM 235 offered only in Fall Semester; BIOL 454 offered only in Spring Semesterserve as a non-BIOL G2 course /*Can serve as a G2 required MATH courseearn a B- or higher as prerequisite for BIOL 362 and 364.and 364.dists required if needed to bring overall total to 120 s.h.and 364.			***************************************				
461 General Microbiology 3 BIOL 454a Immunology Directed Elective b #1 2-4 CHEM 326 Biochemistry I General Elective*** 3 G3 Social Sciences #3 Perspectives Course (P) 3 BIOL Dir Elec b #2 to ≥ 6 s. 131 Physics I with Algebra 4 ENGL 312 or alt. Advanced Writing CAL PROGRAM 15-17 TOTAL S.H. CAL PROGRAM 26 TOTAL S.H. A TRANSFER CREDITS 26 Constructed only in Spring Semester 257 and CHEM 235 offered only in Fall Semester; BIOL 454 offered only in Spring Semester Searn a B- or higher as prerequisite for BIOL 362 and 364. ATH course earn a B- or higher as prerequisite for BIOL 362 and 364. General 364. General 364.		FIFTH SEM	TESTER			SIXTH SEMESTER	
Directed Elective ^b #1 2-4 CHEM 326 Biochemistry I General Elective** 3 G3 BIOL Perspectives Course (P) 3 BIOL 131 Physics I with Algebra 4 ENGL 312 or alt. Advanced Writing TOTAL S.H. CAL PROGRAM TRANSFER CREDITS 26 TRANSFER CREDITS 26 TRANSFER CREDITS 26 TRANSFER CREDITS 3 Gifered only in Fall Semester; BIOL 454 offered only in Spring Semester serve as a non-BIOL G2 course / *Can serve as a G2 required MATH course earn a B- or higher as prerequisite for BIOL 362 and 364. dits required if needed to bring overall total to 120 s.h.	BIOL	461 Genera	l Microbiology	3	BIOL	454 ^a Immunology	2
General Elective** 3 G3 Social Sciences #3 Perspectives Course (P) 3 BIOL I31 Physics I with Algebra $\frac{4}{1}$ ENGL $\frac{1}{3}$ 12 or alt. Advanced Writing TOTAL S.H. $\frac{1}{1}$ 2.7 $\frac{1}{1}$ 3.2 or alt. Advanced Writing TOTAL S.H. $\frac{1}{1}$ 5.17 $\frac{1}{1}$ 5.17 $\frac{1}{1}$ 5.17 $\frac{1}{1}$ 5.17 $\frac{1}{1}$ 6.18 $\frac{1}{1}$ 7.07 $$	BIOL	Directe	d Elective ^b #1	2-4	CHEM	326 Biochemistry I	4
Perspectives Course (P) 3 BIOL Dir Elec ^b #2 to ≥ 6 s. 131 Physics I with Algebra 4 ENGL 312 or alt. Advanced Writing TOTAL S.H. TOTAL S.H. TOTAL S.H. TRANSFER CREDITS 26	ELEC	Genera	l Elective**	3	G3	Social Sciences #3, W	3
131 Physics I with Algebra 4 ENGL 312 or alt. Advanced Writing TOTAL S.H. TRANSFER CREDITS 26 Serve as a non-BIOL G2 course / *Can serve as a G2 required MATH course serve as a non-BIOL G2 course / *Can serve as a G2 required if needed to bring overall total to 120 s.h. Hong overall total total total to 120 s.h. Hong overall total tot	Ъ	Perspec	ctives Course (P)	Ф	BIOL	Dir Elec ^b #2 to \geq 6 s.h. BIOL Elective	2-4
CLINICAL PROGRAM TRANSFER CREDITS a BIOL 257 and CHEM 235 offered only in Fall Semester; BIOL 454 offered only in Spring Semester. S Must earn a B- or higher as prerequisite for BIOL 362 and 364. ** Credits required if needed to bring overall total to 120 s.h. ** Credits required if needed to bring overall total to 120 s.h. 15-17	PHYS	131 Physics	s I with Algebra	41	ENGL	or alt.	ω
CLINICAL PROGRAM TRANSFER CREDITS 26		TOTAL		15-17		TOTAL S.H.	14-16
a BIOL 257 and CHEM 235 offered only in Fall Semester; BIOL 454 offered only in Spring Semester. † Can serve as a non-BIOL G2 course / *Can serve as a G2 required MATH course § Must earn a B- or higher as prerequisite for BIOL 362 and 364. ** Credits required if needed to bring overall total to 120 s.h.	CLINI	CAL PROGR	AM				
^a BIOL 257 and CHEM 235 offered only in Fall Semester; BIOL 454 offered only in Spring Semester. † Can serve as a non-BIOL G2 course / *Can serve as a G2 required MATH course § Must earn a B- or higher as prerequisite for BIOL 362 and 364. ** Credits required if needed to bring overall total to 120 s.h.		TRANS		26			
G2 required MATH course and 364.	^a BIOL	257 and CHEN	M 235 offered only in Fa	Il Semeste	r; BIOL 454 o	ffered only in Spring Semester.	
and 364. J.s.h.	† Can s	erve as a non-I	BIOL G2 course / *Can s	serve as a (32 required M	ATH course	
\circ	§ Must	earn a B- or hi	gher as prerequisite for E	31OL 362	and 364.	Revised 6-28-1	
	** Cre	its required if	needed to bring overall t	otal to 120	s.h.	Annual Company of the	

	m	Bachelor of Science in Allied He	ealth Te	chnologies.	· Nuclear	Science in Allied Health Technologies - Nuclear Medicine Technology Option	
		SAMPLI	E PROC	SAMPLE PROGRAM (120 s.h. minimum)	s.h. mini	mum)	
	FIR	FIRST SEMESTER			SECON	SECOND SEMESTER	
BIOL	100	100 General Biology§	m	G3		Social Sciences #1	3
CHEM	1111	111† Intro Chemistry I	4	COMM	100	Fundamentals of Speech	Э
ENGL	110	110 English Composition	m	MATH	160*	160* Precalculus	4
GI		Humanities #1	3	CHEM	112†	112† Intro Chemistry II	4
BIOL	257ª	257 ^a Intro to Allied Health		WELL	175	175 Wellness	[3
		TOTAL S.H.	14			TOTAL S.H.	17
	THE	THIRD SEMESTER			FOURT	FOURTH SEMESTER	
BIOL	362	362 Cell & Devel. Biology, W	4	BIOL	255	255 Human Anat & Phys II	4
BIOL	254	254 Human Anat & Phys I	4	CHEM	326	326 Biochemistry I	4
CHEM	235 ^a	235 ^a Short Course Organic Chem	4	63		Social Sciences #2, W	3
G1		Humanities #2, W	3	GI		Humanities #3, D	3
				MATH	130†	Elements of Statistics	col
		TOTAL S.H.	15			TOTAL S.H.	17
	FIF	FIFTH SEMESTER			SIXTH	SIXTH SEMESTER	
BIOL	461	461 General Microbiology	æ	BIOL	454ª	454 ^a Immunology	7
BIOL	364	364 Genetics & Molecular Bio	4	BIOL	are many extended by	Directed Elective ^b #1	2-4
ELEC		General Elective**	3	G3		Social Sciences #3, W	B
ᅀ		Perspectives Course (P)	Ю.	BIOL		Dir Elec ^b #2 to \geq 6 s.h. BIOL Electives	2-4
PHYS	131		4	ENGT	312 or alt.	Advanced Writing (AW)	ωl
		TOTAL S.H.	21		· ·	TOTAL S.H.	14-16
CLINIC	CAL 1	CLINICAL PROGRAM					
		TRANSFER CREDITS	26				
		TOTAL AND A SECURITY OF THE PARTY OF THE PAR					
^a BIOL.	257 ar	^a BIOL 257 and CHEM 235 offered only in Fall Semester; BIOL 454 offered only in Spring Semester.	ill Seme	ster; BIOL 4	54 offere	d only in Spring Semester.	
† Can s	erve a	† Can serve as a non-BIOL G2 course / *Can serve as a G2 required MATH course	serve as	a G2 require	ed MATH	course	
§ Must	earn a	§ Must earn a B- or higher as prerequisite for BIOL 362 and 364.	BIOL 36	52 and 364.		Revised 6-28-13	
** Cred	lits rec	** Credits required if needed to bring overall total to 120 s.h.	total to 1	20 s.h.			
^b Minim	ium of	^b Minimum of two directed electives		**************************************			

FIRST SEMESTER Biology 3 CHEM 100 General Biology 3 CHEM 101 General Biology 3 CHEM 103 † Gen, Org, & Biochem I 3 CHEM 103 † Gen, Org, & Biochem I 3 CHEM 105 formalities # 1 Social Sciences # 1 3 COTAL S.H. 15 COTAL S.H.	ce in Allied Health Technologies - Respiratory Therapy Option
SECOND SEMESTER SECOND SEMESTER SECOND SEMESTER	um)
100 General Biology 3 COMM 103 General Biology 3 COMM 103 General Biology 3 COMM 103 General Biology 10 Equipmentals of Spatistics 110 Equipmentals of Spatistics 111 Equipmentals of Spatistics 112 Equipmentals of Spatistics 113 Equipmentals of Spatistics 114 Equipmentals of Spatistics 115 Equipmentals of Spat	2
CHEM 1076 Gen., Org. & Biochem I 3 CHEM 1041 Gen., Org. & Biochem I 130 Elements of Statistics	pentals of Speech
Humanities #1 10 English Composition 3 Humanities #2 G1 Humanities #2 G2 Humanities #2 G2 MV = 1 17 Wellness G2 MV = 1 MV	
Humanities #1 3 WELL 175 Wellness 15 WELL 175 Wellness 1707LL S.H. П	
Corial Sciences #1 3 Corial Sciences #1 15 Wellness	
TOTAL S.H. FOURTL SENTETER FOURTH SENTETER	
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BIOL 461 General Microbiology 3 BIOL 255 Human Anat & Phys II	R
BIOL 254 Human Anat & Phys I 4 4 63 63 63 60 63 60 63 60 64 64 64 64 64 64 64	Anat & Phys II 4
Function Function	
Humanities #5, W 3 5 5 5 5 5 5 5 5 5	3 RESP
Social Sciences #2, D 3 Social Sciences #2, D 17 Social Sciences #3, D 17 Social Sciences #4, D 18 Social Sciences #4, D 19 Social Sciences	
FIFTH SEMESTER TOTAL S.H. 17 WINTER SESSION SIXTH SEMESTER TOTAL S.H. 1	. 3 RESP
RESP 413 Resp Assessment & Therap. 4 RESP 461 Clinical Practicum 1 BIOL 455 Cardiopulmonary Phys RESP 411 Resp Care Techniques III, W	
413 Resp Assessment & Therap. 4 RESP 461 Clinical Practicum I 1 BIOL 455 Cardiopulmonary Phys 411 Resp Assessment & Therap. 4 RESP 461 Clinical Practicum I 1 BIOL 455 Cardiopulmonary Phys 414 Resp Care Techniques II. 3 RESP 417 Resp Care Techniques III. 460 Clinical Practice I 2 RESP 423 Infectious Diseases 419 Resp Care in Alt. Sites 2 RESP 424 Non-Infectious Diseases 419 Resp Care in Alt. Sites 1 TOTAL S.H. I A44 Clinical Practicum III 10 RESP 425 Clinical Practice II I A45 Resp Care Research 2 Resp Care Research 2 A45 Clinical Practicum III 10 Resp Care Research 2 A45 Resp Care Research 2 Resp Care Research 2 A45 Resp Care Research 2 Resp Care Research 2 A45 Resp Care Research 2 Resp Care Research 2 A45 Resp Care Research 2 Resp Care Research 2 A45 Resp Care Research 2 Resp Care Research 2 A45 Resp Care Research 2	STIMMER
413 Resp Assessment & Iherap. 4 RESP 461 Clinical Practicum I 1 BIOL 452 Cardiopulmonary Prys 421 Phys. Mechanical Ventilation 2 417 Resp Care Techniques III, W 414 Resp Care Techniques III 3 415 RESP 421 Inceptious Diseases 460 Clinical Practice I 2 RESP 424 Non-Infectious Diseases 419 Resp Care in Alt. Sites 2 RESP 424 Non-Infectious Diseases 419 Resp Care in Alt. Sites 15 TOTAL S.H. I Add Clinical Practicum III 10 TOTAL S.H. I Add Clinical Practicum II	TOTAL C
Act Prop. Mechanical Ventuation 2	/11/
Total New Care Course Act A	<u>*</u>
425 Neonatology 2 RESP 424 Non-infectious Diseases 419 Resp Care in Alt. Sites 2 RESP 462 Clinical Practice II I TOTAL S.H. I TOTAL S.H. I NTH SEMESTER TOTAL S.H. I 464 Clinical Practicum III 10 Control of the search I 495 Resp Care Research 2 Control of the search I TOTAL S.H. I I I Serve as a non-BIOL G2 course / *Can serve as a G2 required MATH course Revised 6-28-13 Bestream it of the required if needed to bring overall total to 120 s.h. Revised 6-28-13	
419 Resp Care in Alt. Sites 2 RESP 462 Clinical Practice II TOTAL S.H. 1 TOTAL S.H. 1 NTH SEMESTER TOTAL S.H. 1 TOTAL S.H. 464 Clinical Practicum III 10 TOTAL S.H. TOTAL S.H. 495 Resp Care Research 2 TOTAL S.H. TOTAL S.H. 12 TOTAL S.H. 12 Revised 6-28-13 serve as a non-BIOL G2 course / *Can serve as a G2 required if needed to bring overall total to 120 s.h. Revised 6-28-13	
TOTAL S.H. 15 TOTAL S.H. 1 TOTAL S.H. TOTAL S	
NTH SEMESTER 464 Clinical Practicum III 10 495 Resp Care Research 2 TOTAL S.H. 12 serve as a non-BIOL G2 course / *Can serve as a G2 required if needed to bring overall total to 120 s.h.	
495 Resp Care Research 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	
495 Resp Care Research 2 TOTAL S.H. 12 serve as a non-BIOL G2 course / *Can serve as a G2 required MATH course diffs required if needed to bring overall total to 120 s.h.	TOTAL S.H.
Serve as a non-BIOL G2 course / *Can serve as a G2 required MATH course dits required if needed to bring overall total to 120 s.h.	
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ALVALVANOR	sd 6-28-13
Note: The perspectives course (P) is waived for BS ALHT Resp Th.	The state of the s

Three+ years of Allied Health B.S. Degree in Sports Medicine/Pre-Athletic Training for Bloomsburg

		4	4	The state of the s				8			3 (W)				Z.	100,000	
Summer 1		A&P 1	A&P 2						Winter/Summer 2		BIOL 207 Human Sexuality						
		BIOL 254	BIOL 255		TANAMATA TAN						D(W) course	m selektrikation kilokulus kalektri			na ao ao ao ao ao ao ao ao ao ao ao ao ao		
	Credits	4	3	4	3	ĸ		17		3	3 (W)	33	3	m	15		
Spring 1	Title	Chemistry 2	Speech	Pre-calculus	First Aid	Philosophy 100 recommended			Spring 2	Elective	Nutritional Science	Kines & Phys	SOC101/ANTH	PSYC 227or 228	mbensakkan kentan manamankakan menantakkan perketakan kentan dan kentan dan kentan dan kentan dan kentan dan k	or BEGINNING OF 3rd	
	Course	CHEM 112	COMM 100	MATH 160	WSSD 311	G1				G1	BIOL 352	WSSD 450	G 3	63			
The state of the s	Credits	က	4	က	3	က		16		4	4 (W)	4	3		15	END OF 2n	
Fall 1	Title	Gen. Biology	Chemistry 1	English	Wellness	Psychology 100	recommended		Fall 2	Short Organic	Cell Biology	Physics 1	Prevent and	2 1 2		APPLY TO MS PROGRAMS AT END OF 2nd YEAR YEAR OF STUDY AT MU	
	Course	BIOL 100	CHEM 111	ENG 110	WELL 175	63		TOTAL CREDITS		CHEM 235	BIOL 362	PHYS 131	WSSD 375		TOTAL	APPLY TO MS PROGRAI YEAR OF STUDY AT MU	

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	Fall 3			Spring.3		Winter/Summer 3	
ENGL 312	ENGL 312 Adv. Writing	8	BIOL 364 Genetics	Genetics	4		
WSSD 452	Nutri	3	WSSD 582	582 Sports Psyc	3		
	Performance						
WSSD 591 Exercise	Exercise	3	BIOL 375	Biometry	3		
	Physiology						
BIOL 461	Microbiology	3	G1	elective	3		
PSYC 356	Health Psych	3	P course	COMM 461	3		
				Recommended			
TOTAL		15			16		
CREDITS							

Allied Health B.S. Degree in Sports Medicine

	Fall 1			Spring 1	
Course	Title	Credits	Course	Title	Credits
BIOL 100	Gen. Biology	3	CHEM 112	Chemistry 2	4
CHEM 111	Chemistry 1	4	COMM 100	Speech	3
ENG 110	English	3	MATH 160	Pre-calculus	4
WELL 175	Wellness	3	WSSD 311	First Aid	3
G3	Psychology 100 recommended	3	G1	Philosophy 100 recommended	3
TOTAL CREDITS		16			17
	Fall 2		***************************************	Spring 2	
BIOL 254	A&P 1	4	BIOL 255	A&P 2	4
BIOL 362	Cell Biology	4 (W)	BIOL 352	Nutritional Science	3 (W)
CHEM 235	Short Organic	4	WSSD 450	Kines & Phys	3
WSSD 375	Prevent and Care	3	G3	SOC101/ANTH 121recommended	3
1100D 375	Trevent und care	-	G3	PSYC 227or 228 recommended	3
TOTAL CREDITS		15			<u>16</u>
	Fall 3		-	Spring 3	
Course	Title	Credits	Course	Title	Credits
ENGL 312	Adv. Writing	3	BIOL 364	Genetics	4
WSSD 452	Nutri Performance	3	WSSD 582	Sports Psyc	3
WSSD 591	Exercise Physiology	3	BIOL 375	Biometry	3
BIOL 461	Microbiology	3	G1	Elective	3
PSYC 356	Health Psych	3	P course	COMM 461 Recommended	3
TOTAL CREDITS		15			16
	Fall 4			Spring 4	
Course	Title	Credits	Course	Title	Credits
G1	Elective	3	CHEM 326	Biochemistry	4
PHYS 131	Physics 1	4	PHYSICS 132	Physics 2	4
D(W) course	BIOL 207 Human Sexuality Recommended	3 (W)	WSSD 492	Capstone seminar	1
BIOL/WWSD	Elective	2-4	BIOL/WWSD	Elective	2-4
TOTAL CREDITS		12-14	•		11-13

SAMPLE PROGRAM (120 s.h. minimum) (Well-Prepared at Admission) FIRST SEMESTER SECOND SEMESTER SECOND SEMESTER SECOND SEMESTER SECOND SEMESTER SECOND SEMESTER SECOND SEMESTER SECOND SEMESTER SECOND SEMESTER SECOND SEMESTER SECOND SEMESTER SECOND SEMESTER SECOND SEMESTER SEMESTER			BACHI	BACHELOR OF ARTS IN BIOLOGY	IS IN BIOL	OGY			
BIOL 101 Foundations of Biology 4 BIOL 211 Concepts of Zoology 4			F 3	20 s.h. minim	F E	repared at A	dmission)		
SECOND SEMESTER SECOND SEMESTER SECOND SEMESTER A BOLD COND. SEMESTER A BOLD COND. SEMESTER A BOLD COND. SEMESTER A BOLD COND. SEMESTER A BOLD COND. SEMESTER A BOLD COND. SEMESTER A BOLD COND.									
CHEMOL 1117 Inno. Chemistry 1	FIRS	T SEMES	rer		SEC	OND SEMES	TER		
CHEM 1111 Into. Chemistry 1 or 221 Concepts of Botany 114-15 CHEM 1111 Into. Chemistry 4 Or 100 Fundamentals of Speech 2 O'HEM 1010 English Composition 3.4	BIOL	101	Foundations of Biology	4	BIOL	211	Concepts of Zoology	4	
MATH 167 or 1610 Foundamentals of Speech 2 MATH 161 or other Chechius to T. 20	CHEM	111	Intro. Chemistry I	4	or	221	Concepts of Botany		
COMM 100 Fundamentals of Speech 3 MATH 16th or other Calculus 1 or (it, Stats or CSCI) 3.4 TOTAL S.H. 15-16 INDIC 110 English Composition 14-15 TOTAL S.H. 15-16 FOURTH SEMESTER 14-15 BIOL 221 Concepts of Zoology 4 BIOL CHEM SCIGLE Devel Biology, W 4 CHEM 221 Concepts of Zoology CHEM CHEM CHEM SCIGLE Sciences 41 3 GHEM 101 Foreign Language (G1) 3 FORL 1107 Foreign Language (G1) 3 FORL 107 Foreign Language (G1) 3 WELL 115 Wellness Course 3 FORL 345 Ecology & Evolution or 345 Ecology & Evolution or 345 Genetics & Molecular developed & Evolution or 345 Ecology & Evolution or 345 Ecology & Evolution or 345 Ecology & Evolution developed & Evolution or 345 Ecology & Evolution developed & Evolution or 345 Ecology & Evolution developed & Evolution or 345 Ecology & Evolution developed & Evolu	MATH 16	0* or 161(163)	* Precalculus or Calculus I	4-5	CHEM	112†	Intro. Chemistry II	4	
TOTAL S.H. TOTAL S.H. 15.16 ENGL 110 English Composition 3	COMM	100	Fundamentals of Speech	ωl	MATH	161† or other	Calculus I or (II, Stats or CSCI)	3-4	
THIRD SEMESTER 15-16 FOURTH SEMESTER 14-15					ENGL	110	English Composition	3	
THIRD SEMESTER			TOTAL S.H.	15-16			TOTAL S.H.	14-15	
FOURTH SEMESTER									
BIOL 221 Concepts of Botany 4 BIOL 3c1 Cell & Devel. Biology, W 4	THIR	D SEMES	TER		FOU	RTH SEMES	TER		
or 211 Concepts of Zoology CHEM Chemistry, ≥200 level 4 Gg3 Chemistry, ≥200 level 4 Gas Social Sciences #1 5 GCHEM Non-FORL Humanities Course 3 FORL 102 sciences #1 3 FORL 101 scores Non-FORL Humanities Course GI) 3 FORL 177 Meliness Course 3 FORL 101 scores Norder Language GI) 3 WELL 177 Meliness Course 17 BIOL 343 Ecology & Evolution 0 0 344 Genetics & Molecular 4 PPTYS 132 Physics I with Algebra 4 177 Meliness Course 4 FORL 201 scology & Evolution 0 0 344 Genetics & Molecular 4 174 Scology & Evolution 4 or 341 scology & Evolution 4 PPTYS 132 Physics II with Algebra 4 174 Scology & Evolution 4 prox. 201 scology & Evolution 3 PORL 202 scology & Evolution 4 14 G3 Social Sciences #2, W 3 PORL	BIOL	221	Concepts of Botany	4	BIOL	362		4	
CHEM Chemistry,≥200 level 4 G3 Social Sciences #1 3 G1 Non-FORL Humanities (G1) 3 FORL 10.2 ⁸ Foreign Language (G1) 3 FORL 101 Foreign Language (G1) 3 WELL 175 Wellness Course 2 FIFTH SEMESTER TOTAL S.H. 1/4 PRLS TOTAL S.H. 1/7 BIOL 364 Genetics & Molecular 4 BIOL 378 Genetics & Molecular 4 PRTS 138 Physics II with Algebra 4 PRTS 139 Physics II with Algebra 4 PRTS 130 Physics II with Algebra 4 PRTS 130 Physics II with Algebra 4 PRTS 132 Physics II with Algebra 4 PRTS 132 Physics II with Algebra 4 PRTS 132 Physics II with Algebra 4 PRTS 132 Physics II with Algebra 4 PRTS 132 Physics II with Algebra 4 PRTS 132 Physics II with Algebra 4 PRTS 134 Physics II with Algebra 4 PRTS 134 Physics II with Algebra 4 PRTS 134 Physics II with Algebra 4 Algen	or	211	Concepts of Zoology		CHEM	***************************************	Chemistry, ≥200 level	4	
FORL 101 Foreign Language (G1) 3 FORL 102 Foreign Language (G1) 3 FORL 175 Wellness Course 175 FORL 175 Wellness Course 175 FORL 175 Wellness Course 175 FORL 175 F	CHEM	***************************************	Chemistry, >200 level	4	G3		Social Sciences #1	Э	
FIFTH SEMESTER NELL 115 Wellness Course 2 FIFTH SEMESTER SIXTH SEMESTER 17 17 BIOL 343 Ecology & Evolution 4 or 343 Ecology & Evolution 4 PFYS 131 Physics I with Algebra 4 PHYS 132 Physics II with Algebra 4 FORL 2018 Forelation and angage (G1) 3 FORL 2028 Forelation and angage (G1) 3 FORL 2018 Forelation and angage (G1) 3 FORL 2028 Forelation angage (G1) 3 FORL 2018 Forelation angage (G1) 3 P Actual Section angage (G1) 3 SEVENTH SEMESTER FORL 2028 Forelation angage (G1) 3 Actual Section angage (G1) 3 SEVENTH SEMESTER Biology Elective #1 34 BIOL FORL S.H. Actual Sective #2 34 BIOL Biology Elective #1 34 BIOL Forelation angage (G1) 34 BIOL	G1	Non-FORI	Humanities (G1)	3	FORL	102\$	Foreign Language	3	
FIFTH SEMESTER FORL S.H. 14 SIXTH SEMESTER BIOL 364 Genetics & Molecular 4 BIOL 343 Ecology & Evolution 4 BIOL 344 Genetics & Molecular 4 BIOL 364 Genetics & Molecular	FORL	101	Foreign Language (G1)	m	WELL	175		വ	
FIFTH SEMESTER SIXTH SEMESTER BIOL 364 Genetics & Molecular 4 BIOL 343 Ecology & Evolution 4 or 344 Genetics & Molecular 4 PHYS 132 Physics II with Algebra 4 PHYS 131 Physics I with Algebra 4 PHYS 132 Physics II with Algebra 4 FORL 201 [§] Foreign Language (G1) 3 FORL 202 [§] Foreign Language (G1) 3 G3 Social Sciences #2, W 3 P ACRL 202 [§] Foreign Language (G1) 3 G3 Seventh Semester BIOL BIOL ACRL ACRL ACRL ACRL BOL BIOL BIOL BIOL BIOL BIOL BIOL BIOL BIOL ATOTAL S.H BIOL BIOL ATO at 472 Seminar in Biology 1.2 BOL BIOL BIOL BIOL ATO at 472 Seminar in Biology 1.2 BOL General Elective** BIOL BIOL BIOL ATO at 12 ACRL 2.5 BO			TOTAL S.H.	14			TOTAL S.H.	17	
FIFTH SEMESTER SIXTH SEMESTER BIOL 364 Genetics & Molecular 4 BIOL 343 Ecology & Evolution 4 PHYS 131 Physics I with Algebra 4 PHYS 132 Physics II with Algebra 4 PHYS 131 Physics I with Algebra 4 PHYS 132 Physics II with Algebra 4 FORL 2018 Foreign Language (G1) 3 FORL 2028 Foreign Language (G1) 3 G3 Social Sciences #2, W 3 FORL 2028 Foreign Language (G1) 3 BIOL TOTAL S.H. I/4 TOTAL S.H. I/4 SECVENTH SEMESTER BIOL TOTAL S.H. I/4 BIOL ATO or 472 Seminar in Biology 1-2 BSC Social Sciences #3, W 3 BIOL 470 or 472 Seminar in Biology 1-2 G3 Social Sciences #3, W 3 BIOL 470 or 472 Seminar in Biology 1-2 G3 Social Sciences #3, W 3 BIOL 470 or 472 Seminar in Biology 1-2 G4 General Elective*** 3				***************************************					
BIOL 364 Genetics & Molecular 4 BIOL 343 Ecology & Evolution 4 or 343 Ecology & Evolution or 364 Genetics & Molecular 4 PHYS 131 Physics I with Algebra 4 PHYS 132 Physics II with Algebra 4 FORL 201 Foreign Language (G1) 3 FORL 202 Protein Language (G1) 3 G3 Social Sciences #2, W 3 P Perspectives Course (P) 3 G3 Social Sciences #2, W 14 FORL S.H. IA SEVENTH SEMESTER Biology Elective #1 3-4 BIOL FIGHTH SEMESTER 1 BIOL Biology Elective #1 3-4 BIOL Biology Elective #2 3-4 BIOL Biology Elective #1 3-4 BIOL Biology Elective #2 3-4 BIOL Biology Elective #1 3-4 BIOL Biology Elective #2 3-4 BIOL General Elective #3 BIOL Biology Elective #3 1-2 Ganeral Elective #4 BIOL General Elective #3 <td>FIFT</td> <td>H SEMES</td> <td>rer</td> <td></td> <td>SIX</td> <td>TH SEMEST</td> <td>ER</td> <td></td> <td></td>	FIFT	H SEMES	rer		SIX	TH SEMEST	ER		
or 343 Ecology & Evolution or 364 Genetics & Molecular PHYS 131 Physics II with Algebra 4 PHYS 132 Physics II with Algebra 4 PHYS 132 Physics II with Algebra 4 PHYS 4 PHYS 132 Physics II with Algebra 4 PHYS 4 PHYS 132 Physics II with Algebra 4 PHYS 4 <	BIOL	798	Genetics & Molecular	4	BIOL	343	Ecology & Evolution	4	
FORL 131 Physics I with Algebra 4 PHYS 132 Physics II with Algebra 4 FORL 201 [§] Foreign Language (G1) 3 FORL 202 [§] Foreign Language (G1) 3 G3 Social Sciences #2, W 3 P Perspectives Course (P) 3 SEVENTH SEMESTER If A CALL S.H. If A CALL S.H. If A CALL S.H. If A CALL S.H. BIOL Biology Elective #1 3.4 BIOL Biology Elective #2 3.4 BCI Earth Science, ≥ 200 level 3.4 BIOL 4.70 or 472 Seminar in Biology 1.2 G3 Social Sciences #3, W 3 BIOL Elective *6 For total of 33 BIOL s.h. 0.2 D Diversity Course (D) 3 ENGL 312 or alt Advanced Writing (AW) 3 ELEC General Elective ** 15-17 ELEC General Elective(s) ** 3 † Can serve as a G2 required MATH course *Can serve as a G2 required MATH course *Can serve as a G2 required MATH course *Can serve as a G2 required Botacinn requirement for 2 additional Humanities Courses (G1) is met by taking beginning or intermiediate FORL courses.	or	343	Ecology & Evolution		or	364	Genetics & Molecular		
FORL 201 [§] Foreign Language (G1) 3 FORL 202 [§] Foreign Language (G1) 3 G3 Social Sciences #2, W 3 P Perspectives Course (P) 3 SEVENTH SEMESTER IOTAL S.H. 14 TOTAL S.H. 14 SEVENTH SEMESTER Biology Elective #1 3.4 BIOL ATO or 472 S.H. 17 BIOL ESCI Biology Elective #1 3.4 BIOL ATO or 472 Seminar in Biology 1-2 ESCI Esciences #3, W 3 BIOL Elective #1 3.4 BIOL Biology Elective #2 3.4 G3 Social Sciences #3, W 3 BIOL Elective #2 For total of 33 BIOL s.h. 0.2 G3 General Elective *** 15-17 General Elective (**** 13-17 ACan serve as a non-BIOL G2 course 15-17 TOTAL S.H. 13-17 † Can serve as a G2 required MATH course ***Can serve as a G2 required MATH course Revised 7-8-13 ***Can serve as a G2 required met for 2 additional Humanities Courses (G1) is met by taking beginning or intermiediate FORL courses	PHYS	131	Physics I with Algebra	4	PHYS	132	Physics II with Algebra	4	
G3 Social Sciences #2, W 3 P Perspectives Course (P) 3 EVENTH SEMESTER EIGHTH SEMESTER FIGHTH SEMESTER JA JA BIOL FIGHTH SEMESTER JA JA BIOL FIGHTH SEMESTER BIOL AICH SIGNES 2.4 BIOL BIOL 470 or 472 Seminar in Biology 1-2 3-4 BIOL BIOL AICH OR 472 Seminar in Biology 1-2 3-4 G3 Social Sciences #3, W 3 BIOL Elective* For total of 33 BIOL sh. 0-2 BLEC General Elective*** 3 ELEC General Elective(s)*** 3 † Can serve as a non-BIOL G2 course 15-17 TOTAL S.H. 13-17 † Can serve as a G2 required MATH course AICH S.H. Revised 7-8-13 BIOL **Countered Electrive** Revised 7-8-13 BIOL BIOL AICH S.H. BIOL **Construction requirement for 2 additional Humanities Cour	FORL	201	Foreign Language (G1)	3	FORL	202	Foreign Language (G1)	m	
SEVENTH SEMESTER Id TOTAL S.H. 14 TOTAL S.H. 14 SEVENTH SEMESTER EIGHTH SEMESTER EIGHTH SEMESTER 14 BIOL Biology Elective #1 3-4 BIOL Biology Elective #2 3-4 BIOL Earth Science, ≥ 200 level 3-4 BIOL 470 or 472 Seminar in Biology 1-2 G3 Social Sciences #3, W 3 BIOL 470 or 472 Seminar in Biology 1-2 D Diversity Course (D) 3 BIOL 470 or 472 Seminar in Biology 1-2 D Diversity Course (D) 3 BIOL 512 or alt Advanced Writing (AW) 3 ELEC General Elective** 3 ELEC General Elective(s)** 3 TOTAL S.H. 15-17 15-17 TOTAL S.H. 13-17 † Can serve as a non-BIOL G2 course 15-17 Revised 7-8-13 13-17 † Can serve as a G2 required MATH course 15-17 Revised 7-8-13 Revised 7-8-13	G3		Social Sciences #2, W	<u>2</u>	Ъ		Perspectives Course (P)	3	
SEVENTH SEMESTEREIGHTH SEMESTERBIOLBiology Elective #13-4BIOLBiology Elective #23-4BIOLEarth Science, \geq 200 level3-4BIOL470 or 472Seminar in Biology1-2G3Social Sciences #3, W3BIOL 470 or 472Seminar in Biology1-2DDiversity Course (D)3ENGL312 or alt Advanced Writing (AW)3ELECGeneral Elective**3ELECGeneral Elective(***3ELECGeneral Elective(***)15-17TOTAL S.H.13-17† Can serve as a non-BIOL G2 course15-17TOTAL S.H.13-17† Can serve as a G2 required MATH courseRevised 7-8-13Revised 7-8-13* Can serve as a G2 requirement for 2 additional Humanities Courses (G1) is met by taking beginning or intermiediate FORL courses.			TOTAL S.H.	14			TOTAL S.H.	14	
SEVENTH SEMESTER EIGHTH SEMESTER BIOL Biology Elective #1 3-4 BIOL 470 or 472 Seminar in Biology 1-2 ESCI Earth Science, ≥ 200 level 3-4 BIOL 470 or 472 Seminar in Biology 1-2 G3 Social Sciences #3, W 3 BIOL Elective ** 0-2 D Diversity Course (D) 3 ELEC General Elective ** 3 ELEC General Elective ** 3 ELEC General Elective (s)** 2-5 ELEC General Elective (s)** 15-17 TOTAL S.H. 13-17 † Can serve as a non-BIOL G2 course 15-17 TOTAL S.H. 13-17 † Can serve as a G2 required MATH course *Can serve as a G2 required MATH course Revised 7-8-13 Revised 7-8-13 \$ Contraction requirement for 2 additional Humanities Courses (G1) is met by taking beginning or intermiediate FORL courses. **Can serve as a G2 required Mathematics Courses							1. 1.1.1		
BIOLBiology Elective #13-4BIOL470 or 472Seminar in Biology3-4ESCIEarth Science, \geq 200 level3-4BIOL470 or 472Seminar in Biology1-2G3Social Sciences #3, W3BIOLElective * For total of 33 BIOL s.h.0-2DDiversity Course (D)3ELECGeneral Elective **3ELECGeneral Elective **3ELECGeneral Elective (s) **3TOTAL S.H. $I5-I7$ $I5-I7$ $I3-I7$ † Can serve as a non-BIOL G2 course $I5-I7$ $I5-I7$ $I3-I7$ *Can serve as a G2 required MATH course**Can serve as a G2 required matter for 2 additional Humanities Courses (G1) is met by taking beginning or intermiediate FORL courses.	SEVEN	IH SEME		,	213	HIH SEMES	IER S		
G3 Social Sciences #3, W 3 BIOL Elective [§] For total of 33 BIOL s.h. 0-2 D Diversity Course (D) 3 ENGL 312 or alt Advanced Writing (AW) 3 ELEC General Elective** 3 ELEC General Elective(s)** 2-5 FLEC General Elective(s)** 15-17 Can serve as a non-BIOL G2 course *Can serve as a G2 required MATH course \$\frac{\}{\}^{\}\$The General Education requirement for 2 additional Humanities Courses (G1) is met by taking beginning or intermiediate FORL courses.	BIOL		Biology Elective #1	3-4	BIOL	CEN OFF	Biology Elective #2	1 2	
Diversity Course (D) 3 BIOL Elective For total of 33 BIOL S.n. 0-2	ESCI		Earth Science, 2 200 level	4-0	DIOL	2/+ 10 0/+	Schilliat in Blotogy	7-1	
Diversity Course (D) 3 ENGL 312 or alt Advanced Writing (AW) 3	3		Social Sciences #3, W	c	BIOL	Elective	For total of 33 BIOL S.n.	7-0	
ELEC General Elective** 3 ELEC General Elective** 3 FLEC General Elective(s)** 2-5 General Elective(s)** 2-5 FCan serve as a non-BIOL G2 course 15-17 13-17 *Can serve as a G2 required MATH course *Can serve as a G2 requirement for 2 additional Humanities Courses (G1) is met by taking beginning or intermiediate FORL courses. Revised 7-8-13	Д		Diversity Course (D)	3	ENGE	312 or alt	Advanced Writing (AW)	3	***************************************
† Can serve as a non-BIOL G2 course *Can serve as a G2 required MATH course *The General Elective(s)** Formation requirement for 2 additional Humanities Courses (G1) is met by taking beginning or intermiediate FORL courses.	ELEC		General Elective**	m	ELEC		General Elective**	Э	
† Can serve as a non-BIOL G2 course *Can serve as a G2 required MATH course \$\frac{8}{7}\$The General Education requirement for 2 additional Humanities Courses (G1) is met by taking beginning or intermiediate FORL courses.					ELEC		General Elective(s)**	2-5	
† Can serve as a non-BIOL G2 course *Can serve as a G2 required MATH course \$\times The General Education requirement for 2 additional Humanities Courses (G1) is met by taking beginning or intermiediate FORL courses.			TOTAL S.H.	15-17			TOTAL S.H.	13-17	
*Can serve as a G2 required MATH course \$\frac{8}{7}\$The General Education requirement for 2 additional Humanities Courses (G1) is met by taking beginning or intermiediate FORL courses.	† Can serv	e as a non-l	BIOL G2 course						
*The General Education requirement for 2 additional Humanities Courses (G1) is met by taking beginning or intermiediate FORL courses.	*Can serve	a as a G2 re	mired MATH course	***************************************			Revised 7-8-13		
110 Concar Education requirement for a administration of the following of	SThe Cane	ral Education	no requirement for 2 additional Li	manities Cour	ses (G1) is m	et by taking by	oginning or infermiediate FOR	I conress	
THE PERSON OF TH	1110 Octiv	יים דמתהמוו	on tequine to the sample of the form	The contract of the contract o	m er (10) coc	of characters of the	Printing of missimissing to a second		

					DACHELON OF ANIS IN DIOLOGI		PAFLA	
	S.	SAMPLE PROGRAM (120 s.h. minimum) (Less Prepared	0 s.h. min	imum) (Les	s Prepared	at Admission)		
FIRS	FIRST SEME	STER		SECOND	OND SEMESTER	STER		
BIOL	101	Foundations of Biology	4	BIOL	211	211 Concepts of Zoology	4	
MATH	101		3	or	221	Concepts of Botany		
ENGL	110		3	CHEM	1114	111† Intro. Chemistry I	4	
G		Humanities #1	3	MATH	110/160*	110/160* Trigonometry/Precalculus	4-6	
WELL	175	Wellness	33	COMM		100 Fundamentals of Speech	C)	
		TOTAL S.H.	91			TOTAL S.H.	15-17	
THIR	THIRD SEME	STER		FOURTH	RTH SEMESTER	STER		
BIOL	221	Concepts of Botany	4	BIOL	362	362 Cell & Devel. Biology, W	4	
or	211	1		ESCI		Earth Science, ≥ 200 level	3-4	
CHEM	112+		4	G3		Social Sciences #1	3	
MATH	161		4	GI	Non-FORL		3	
FORL	101	Foreign Language (G1)	3	FORL	102\$	Foreign Language (G1)	3	
		TOTAL S.H.	15			TOTAL S.H.	71-91	
FIFT	FIFTH SEME	STER		SIXTH	TH SEMESTER	TER		
BIOL	364	Genetics & Molecular	4	BIOL	343	343 Ecology & Evolution	4	
or	343	Ecology & Evolution		or	364	364 Genetics & Molecular		
CHEM		Chemistry, ≥200 level	4	CHEM		Chemistry, ≥200 level	4	
G3		Social Sciences #2, W	3	G3		Social Sciences #3, W	3	
FORL	201	Foreign Language (G1)	.col	FORL	202	2028 Foreign Language (G1)	m	
	***************************************	TOTAL S.H.	14	-		TOTAL S.H.	14	
SEVEN	SEVENTH SEM	TESTER		RICI	RICHTH SEMESTER	STER		
BIOL			3-4	BIOL		Biology Elective #2	3-4	
PHYS	131		4	BIOL	Elective		0-2	
ط		Perspectives Course (P)	3	BIOL	470 or 472	470 or 472 Seminar in Biology	1-2	
Д		Diversity Course (D)	3	PHYS	132	132 Physics II with Algebra	4	
ELEC		General Elective**	1-3	ENGL	312 or alt	312 or alt Advanced Writing (AW)	3	
				ELEC		General Elective**	0-3	
		TOTAL S.H.	14-17			TOTAL S.H.	12-16	
						4 7 4 8 9		
† Can ser	ve as a n					Revised 7-8-13		
*Can serve as a G2	re as a G.	2 required MATH course						
The Gen	eral Educ	cation requirement for 2 ad	lditional H	(umanities C	ourses (G1)	§The General Education requirement for 2 additional Humanities Courses (G1) is met by taking beginning or intermiediate FO	intermiediat	te FO
** Credits required	s required	d if needed to bring overall total to 120	total to 1	20.				

FIRST SEMESTER		SAMPLE PROGRAM (120 s.h. minimum) (Well-Prepared at admission)	A (120 s.h. mi)	nimum) (Well-	-Prepared at	admission)	
	MES	TER		SEC	SECOND SEMESTER	STER	
	101	Foundations of Biology	4	BIOL	211	211 Concepts of Zoology	4
H Z B	1111	111† Intro. Chemistry I	4	or	221	221 Concepts of Botany	
OMM THIRD SI	161(163)*	160* or 161(163)* Precalculus or Calculus I	4-5	CHEM	112†	112† Intro. Chemistry II	4
THIRD SI	100	100 Fundamentals of Speech	rn	MATH	161† or other	or other Calculus I or (II, Stats or CSCI)	3-4
THIRD SI				ENGL	110	110 English Composition	ωl
THIRD SI		TOTAL S.H.	15-16			TOTAL S.H.	14-15
3IOL	EMES	TER		FOU	FOURTH SEMESTER	STER	
or	221	Concepts of Botany	4	BIOL	362	362 Cell & Devel. Biol., W	4
3	211	Concepts of Zoology		CHEM	232	232 Organic Chem II	4
CHEM	231	Organic Chem I	4	PHYS	132	132 Physics II with Algebra	4
PHYS	131	Physics I with Algebra	4	G1		Humanities #1	w)
WELL	175	175 Wellness	3				
		TOTAL S.H.	15			TOTAL S.H.	15
FIFTH SEMES	MES	TER		SIX	SIXTH SEMESTER	TER	
BIOL	364	364 Genetics & Molecular	4	BIOL	343	343 Ecology & Evolution	4
or	343	343 Ecology & Evolution	70-10-10-10-10-10-10-10-10-10-10-10-10-10	or	364	364 Genetics & Molecular	
CHEM	326	326 Biochemistry I	4	BIOL	A Mary James Mary Annie Mary Anni	Biology Elective [§] #1	3
***************************************		Diversity Course (D)	3	BIOL		Biology Elective [§] #2, W	κ
G3		Social Sciences #1, W	3	G1		Humanities #2	3
				G3		Social Sciences #2	8
		TOTAL S.H.	14			TOTAL S.H.	91
THE LEGISLATION OF THE PROPERTY OF THE PROPERT				Ī		9.414	
	SELVIE	ALER		בוב	ANAS TIT	ALER	
BIOL 472 (or 470	472 or 470 Seminar in Biology	1-2	BIOL		Biology Elective ⁸ #5	3
BIOL		Biology Elective [§] #3	3-4	BIOL	Elective #6	#6 For total of 43 BIOL s.h.	0-3
BIOL		Biology Elective [§] #4	3	G3		Social Sciences #3	E
ENGL 312	or al	t Advanced Writing (AW)	6			Perspectives Course (P)	E
GI		Humanities #3	<u>හ</u>	ELEC		General Elective**	æ
	THE RESERVE OF THE PERSON NAMED IN COLUMN 1			ELEC		General Elective**	0-3
		TOTAL S.H.	13-15			TOTAL S.H.	14-18
]						AVARIANCE
Can serve as	a non-j	T Can serve as a non-BIOL G2 course			***************************************		
Can serve as a	a G2 re	*Can serve as a G2 required MATH course			OCH BUICO NA BUICA PARABIMANTA PROPERTY	Revised 6-28-13	
§At least 12 s.h.	of e	of electives must be 300-level or above	above.				
** Credits required in	ired if	r needed to bring overall total to 120.	ul to 120.				

		BACHE	BACHELOR OF SCIENCE		IN BIOLOGY		***************************************
		SAMPLE PROGRAM (120 s.h. minimum) (Less Prepared at admission)	A (120 s.h. mi	nimum) (Less	Prepared at a	admission)	
FIR	FIRST SEMES	STER		SEC	SECOND SEMESTER	STER	
BIOL	101	Foundations of Biology	4	BIOL	211	211 Concepts of Zoology	4
MATH	101	\vdash	3	or	221	Concepts of Botany	
ENGT	110		3	CHEM	**************************************	111† Intro. Chemistry I	4
G1		Humanities #1	3	MATH	110/160*	110/160* Trigonometry/Precalculus	4-6
WELL	175	Wellness	3	COMM	100	100 Fundamentals of Speech	3
		TOTAL S.H.	91			TOTAL S.H.	15-17
THD	THIRD SEMES	STER		FOL	FOURTH SEMESTER	STER	
BIOL	221	Concepts of Botany	7	BIOL	362	362 Cell & Devel. Biol. W	4
or	211	Concepts of Zoology		CHEM	231	231 Organic Chem I	4
CHEM	112+		4	G1		Humanities #3	3
MATH	161+	-	4	G3		Social Science #1	3
5		Humanities #2	(3)				
		TOTAL S.H.	15	***************************************	***************************************	TOTAL S.H.	14

FIET	FIFTH SEMES	STER		SIXTH	SIXTH SEMESTER		
BIOL	364	Genetics & Molecular	4	BIOL	343	Ecology & Evolution	4
or	343	Ecology & Evolution		or	364	364 Genetics & Molecular	
CHEM	232	Organic Chem II	4	BIOL		Biology Elective [§] #3, W	3
BIOL		Biology Elective #1	3	CHEM	326	Biochemistry I	4
BIOL		Biology Elective§ #2	3-4	G3		Social Sciences #2, D	3
		TOTAL S.H.	14-15			TOTAL S.H.	14
SEVE	SEVENTH SEME	FOTER		SIE	FICHTH SEMESTER	TER	
SAHd	131	Physics I with Algebra	4	SAHd	132	132 Physics II with Algebra	4
BIOL			3-4	BIOL	472 or 470	472 or 470 Seminar in Biology	1-2
BIOL		Biology Elective [§] #5	3	BIOL	Elective #6	Elective #6 For total of 43 BIOL s.h.	0-3
ENGL	312 or alt		3	G3		Social Sciences #3, W	3
		Perspectives Course (P)	rol	ELEC		General Elective**	3
				ELEC		General Elective**	0-2
		TOTAL S.H.	16-17			TOTAL S.H.	12-16
-		TOTOL		***************************************			
T Can se	rve as a noi	T Can serve as a non-BIOL GZ course					***************************************
*Can ser	ve as a G2	*Can serve as a G2 required MATH course				Revised 6-28-13	
§At least	§At least 12 s.h. of el	electives must be 300-level or above	or above				
** Credit	s required	** Credits required if needed to bring overall total to 120	otal to 120.	-			

SAMPE PROCRAM (125 h. minimum) (Well-Propered at Admission)			BACHEL	OR'S DEG	BACHELOR'S DEGREE: BSE		
MOTE: Education students must listed and federal forms (Criminal Controlled Set and 151), BACH year.		SA	MPLE PROGRAM (126 s.h	ı. minimun	n) (Well-Pro	spared at Admission)	
FIRST SEMESTER	NOTE: Educat	ion students r	nust fill out state and federal	forms (Cri	minal Clears	ince Acts 34 and 151) EACH year.	
Dec. FIREST SEMESTER Proceedings A BIOL 211 Concepts of Bottany A BIOL B	NOTE: The str	ident must tak	ce the PRAXIS test (required	by the PDE	i) at least a s	emester before student teaching.	
BIOL		≥	TER			SECOND SEMESTER	
CHEM Italy Intro. Chemistry I 4 or 221 Concepts of Bloating 4 or 221 Concepts of Statistic Concept	BIOL	101	Foundations of Biology	4	BIOL	211 Concepts of Zoology	4
MATH 10st or singless Precalculus 4-5 CHEM 112 Intro. Chemistry 4-5 CHEM 112 Intro. Chemistry 4-5 ENGL 110 English Composition 2 ENGL 110 English Composition 2 ENGL 110 English Composition 2 ENGL 2 ENGL 2 English 2 ENGL	CHEM	1111	Intro. Chemistry I	4	οī	221 Concepts of Botany	
Prepared 110 English Composition 2 ENGL Literature Course, Gir #i 3	MATH		* Precalculus or Calculus I	4-5	CHEM	112† Intro. Chemistry II	4
PPST* Pre-Professional Skills Test COMMY 100 Fundamentals of Speech 2 1 1 1 1 1 1 1 1 1	ENGL	110	English Composition	33	ENGT	Literature Course, G1 #1	3
THIRD SEAMESTER 15-16 COMM 100 Endeaths of Speech 17	PPST ^a		Pre-Professional Skills Test		83	Social Sciences #1, W	m.
TOTAL S.H. 15-16 TOTAL S.H. 15-16 TOTAL S.H. 17	***************************************				COMM		(C)
THIRD SEMESTER BIOL 221 Concepts of Befrany BIOL 362 Cell & Dev. Biology, W 4			TOTAL S.H.	15-16		TOTAL S.H.	17
STATION SEMBLESTER A							Landa de la casa de la
BIOL 221 Concepts of Botany 4 BIOL 350 Cell, Bore Biology, W 4		3	STER			FOURTH SEMESTER	L ACCILILATION ANNAVANT
or 231 Concepts of Zoology CCHEM 336 Biochemistry 4 CHEM 232 Stort Course Ciganic Chem. 4 ESCI Earl Sciences #2 3 EDFN 231 Factor of Modern Ed. 3 G33 Social Sciences #2 3 WELL 175 Wellness 3 G7 Int. S.H. 14-15 WELL 175 Wellness 3 TOTAL S.H. 14-15 BIOL 364 Genetics & Molecular 4 BIOL 345 Ecology & Evolution 4 BIOL 376 Biometry 34 Biology Elective #1 34 GI Humantice #3, D 3 BIOL 375 Biometry 34 GI Humantice #3, D 3 3 BIOL BIOL BIOL 34 GI Humantice #3, D 3 BIOL BIOL BIOL BIOL 34 GI Humantice #3, D 3 BIOL Humantice #2 BIOL BIOL BIOL 312 cral Advanced Writing (AW) 3 BIOL Humantice #2 BIOL BIOL 3	BIOL	221	Concepts of Botany	4	BIOL	362 Cell & Dev. Biology, W	4
CHEM 233 ⁸ Short Course Organic Chem 4 ESCI Earth Science, ≥ 200 leve 3.4 EDFN 211 Faths of Modeun Ed 3 G3 Social Sciences #2 2 WELL 1.75 Wellness 3 G3 Social Sciences #2 2 WELL 1.75 Wellness 3 TOTAL S.H 14-15 14-15 WELL 1.75 Mellness Molecular 1 17-15 Molecular 4 14-15 BIOL 3.45 Genetics & Molecular 4 BIOL 3.41 Ecology & Evolution 4 PHYS 13-15 Physics with Algebra 4 4 BIOL 3.15 Bionegy 15-15 Physics with Algebra 4 G3 Social Sciences #3.D 3 BIOL 17 Humanities #3.D 3 BIOL Biology Elective #1 3.4 G1 Humanities #3.D 3 3 17 BIOL Biology Elective #1 18.6 A.M. 11.5 A.M. 17 17 17 BIOL A.M. BIOL B.M.	or	211	Concepts of Zoology		CHEM	326 Biochemistry	4
EDFN 21 Fdns of Modern Ed 3 G3 Social Sciences #2 3	CHEM	235	b Short Course Organic Chem.	4	ESCI	Earth Science, ≥ 200 leve	3-4
EDFN 241 Psyc Fetas Teaching 3 175 Wellness 3 175 Wellness 3 170 Mellness 3 170 Mell	EDFN	211	Fdns of Modern Ed	3	<u>G</u> 3	Social Sciences #2	rol
WELL 175 Wellness 3 TOTAL S.H 17-15 FIFTH SEMESTER TOTAL S.H 17-15 Hells Id-15 BIOL 364 Genetics & Molecular 4 BIOL 343 Ecology & Evolution 4 BIOL 364 Genetics & Molecular 4 BIOL 343 Ecology & Evolution 4 BIOL 375 Bouncarty 3 PHYS 13-15 Physics with Algebra 4 4 BIOL 376 Bouncarty 4 GI Humanities #3.D 3 3 BIOL Hology Elective #1 3-4 GI Humanities #3.D 3 3 BIOL Hology Elective #1 3-4 GI Humanities #3.D 3 3 BIOL Hology Elective #1 3-4 GI Humanities #3.D 3 3 BIOL Hology Elective #1 18\$ CITAL S.H 17 3 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	EDFN	241	Psyc Fdns Teaching	3			
FIFTH SEMESTER (Take PRAXIS) 17 1707AL S.H. 14-15	WELL	175	Wellness	3		ALALA ALALA	
SIXTH SEMESTER			TOTAL S.H.	17			4-15
BIOL SIXTH SEMESTER A BIOL 343 Ecology & Evolution 4							
BIOL 364 Genetics & Molecular 4 BIOL 343 Ecology & Evolution 4 BIOL 375 Biometry 3 PHYS 132 Physics with Algebra 4 BIOL Blology Elective #1 3-4 G3 — Social Sciences #5, D 3 BIOL Elective #2 For total of 22 BIOL s.h. 0-1 ENGL 312 or alt Advanced Writing (AW) 3 G1 Humanities #2, W 3 1 FNGL 312 or alt Advanced Writing (AW) 3 G1 Humanities #2, W 3 1 FNGL 312 or alt Advanced Writing (AW) 3 G1 TOTAL S.H. 18\$ 7 TOTAL S.H. 17 17 SEVENTH SEMESTER (Last chance to take PRAXIS) 1 EDSC 461 Student Teaching (AW) 3 17 BIOL 4713 Methods Teach Biology 1 EDSC 471 Differentiated Instruction 3 BDFN 001: EDSC 471 Differentiated Instruction 3 BDFN 001: EDSC 471 Differentiated Instruction 3 BDFN 001: EDSC 471 Differentiated Instruction 471 Differentiated Instru	FI	FTH SEMES	TER			SIXTH SEMESTER (Take PRAXIS)	
BIOL 375 Biometry 3 PHYS 132 Physics with Algebra 4 G3 Social Sciences #3, D 3	BIOL	364	4 Genetics & Molecular	4	BIOL	343 Ecology & Evolution	4
PHYS 131 Physics with Algebra 4 G33 Social Sciences #3, D 3 BIOL	BIOL	375	5 Biometry	3	PHYS	132 Physics with Algebra	4
BIOL Elective #2 For total of 32 BIOL s.h. 0-1 ENGL 31 or all Advanced Writing (AW) 3 BIOL Humanities #2, W 3 3 18 3 18 3 18 3 18 3 18 3 18 3 18 3 18 3 18 18 3 18	PHYS	131	Physics with Algebra	4	G3	Social Sciences #3, D	3
BIOL Elective #2 For total of 32 BIOL s.h. 0-1 ENGL 312 or all Advanced Writing (AW) 3	BIOL		Biology Elective #1	3-4	GI	Humanities #3	3
Humanities #2, W 3 TOTAL S.H. 17	BIOL	Elective #2	For total of 32 BIOL	0-1	ENGL		(2)
SEVENTH SEMESTER (Last chance to take PRAXIS) ISFAMENTER ISPANOR: EACH SEMESTER ISPANOR: EACH EACH SEMESTER ISPANOR: EACH EACH EACH EACH EACH EACH EACH EACH	GI		Humanities #2, W	(C)			
SEVENTH SEMESTER (Last chance to take PRAXIS) EIGHTH SEMESTER BIOL 473 ^b Methods Teach Biology 1 EDSC 461 Student Teaching 9 EDFN 001: EDFN 321 Issues in Teaching Sec. Ed. 3 EDSE 471 Differentiated Instruction 3 EDFN 001: EDFN 330 Instruc. Technology Design 3 EDSE 471 Differentiated Instruction 3 EDFN 001: EDFN 340 Content Area Literacy 3 EDSE 471 Differentiated Instruction 3 EDFN 001: SPED 346 Sec. Students w/ Disabilitie 3 EDSE 7 7 EDSE 435 ^b Teaching of Science 3 16 7 7 12 EDSE 707AL S.H. 16 7 7 12 12 **CHEM 235, BIOL 473, and EDSE 435 are only offered in the Fall semester **Can serve as a G2 required MATH course / † Can serve as a non-BIOL G2 course **Revised 7-8-13 ***Also for the course of these courses could be completed during Winter or Summer Note: The perspectives course (P) is waived for BSE program. ***Can serve course coul			TOTAL S.H.	18§		TOTAL S.H.	17
SEVENTH SEMESTER (Last chance to take PRAXIS) EIGHTH SEMESTER BIOL 473 ^b Methods Teach Biology 1 EDSC 461 Student Teaching 9 BIOL 321 Issues in Teaching Sec. Ed. 3 EDSE 471 Differentiated Instruction 3 EDFN 001: EDFN 330 Instruc. Technology Design 3 EDSE 471 Differentiated Instruction 3 EDFN 001: EDFN 340 Content Area Literacy 3 Content Area Literacy 3 EDSE 475 EDSE 12 EDSE EDFN 001: EDFN 12 EDFN 001: EDFN 12 EDFN 001: EDFN 12 EDFN 001:							
BIOL 473 ^b Methods Teach Biology 1 EDSC 461 Student Teaching 9 EDFN 001: EDFN 321 Issues in Teaching Sec. Ed. 3 EDSE 471 Differentiated Instruction 3 EDFN 001: EDFN 330 Instruc. Technology Design 3 Score Students w. Disabilitie 3 Score Students of Score Score Students of Score Scor	SEVENTH SE	MESTER (L	ast chance to take PRAXIS			EIGHTH SEMESTER	
EDFN 001: EDFN 321 Issues in Teaching Sec. Ed. 3 EDSE 471 Differentiated Instruction 3 EDSE EDFN 001: EDFN 330 Instruct. Technology Design: 3 EDSE 471 Differentiated Instruction 3 EDSE EDFN 001: EDSE 340 Content Area Literacy 3 EDSE 3 EDSE 3 EDSE EDFN 001: SPED 346 Sec. Students w/ Disabilitie 3 EDSE 3 EDSE 3 EDSE EDFN 001: SPED 435 Teaching of Science 3 EDSE 3 EDSE 3 EDSE EDSE 435 Teaching of Science 3 EDSE 3 EDSE 3 EDSE *Students should take the Pre-Professional Skills Tests (PPST) the 1st semester 1 COTAL S.H. 12 *CHEM 235, BIOL 473, and EDSE 435 are only offered in the Fall semester Revised 7-8-13 Revised 7-8-13 *Can serve as a Gz required MATH course / † Can serve as a non-BIOL Gz course *Note: Student will need to wait until the end of registration to enroll in >17 credits, or one of these courses could be completed during Winter or Summer Note: The perspectives course (P) is waived for BSE program. 3 EDSE 471 BEDSE 471 BEDSE BEDSE BEDSE BEDSE BEDSE BEDSE BEDSE BEDSE	BIOL	473	^b Methods Teach Biology	1	EDSC	461 Student Teaching	6
EDFN 001: EDFN 330 Instruc. Technology Design 3 Assumer Assumer Both Content Area Literacy 3 Assumer Both Content Area Literacy 3 Assumer Both Content Area Literacy 3 Both Content Area Literacy 3 Both Content Area Literacy 3 Both Content Area Literacy Both Content Area Literacy 3 Both Content Area Literacy	EDFN 001: EDFN		Issues in Teaching Sec. Ed.	3	EDSE	471 Differentiated Instruction	3
EDFN 001: EDSE 340 Content Area Literacy 3 6 EDFN 001: SPED 346 Sec. Students w/ Disabilitie 3 705ED 346 Sec. Students should take the Pre-Professional Skills Tests (PPST) the 1st semester of freshman year. *CHEM 235, BIOL 473, and EDSE 435 are only offered in the Fall semester of freshman year. *Can serve as a G2 required MATH course / † Can serve as a non-BIOL G2 course *Note: Student will need to wait until the end of registration to enroll in >17 credits, or one of these courses could be completed during Winter or Summer Note: The perspectives course (P) is waived for BSE program.	EDFN 001: EDFN		Instruc. Technology Design	Э			
EDSE 435 ^b Teaching of Science 3	EDFN 001: EDSE		Content Area Literacy	3			
EDSE 435 ^b Teaching of Science 3 TOTAL S.H. 12 **Students should take the Pre-Professional Skills Tests (PPST) the 1st semester of freshman year. **Can serve as a G2 required MATH course / † Can serve as a non-BIOL G2 course **Note: Student will need to wait until the end of registration to enroll in >17 credits, or one of these courses could be completed during Winter or Summer Note: The perspectives course (P) is waived for BSE program.	EDFN 001: SPED		Sec. Students w/ Disabilitie	3			
*Students should take the Pre-Professional Skills Tests (PPST) the 1st semester of freshman year. *CHEM 235, BIOL 473, and EDSE 435 are only offered in the Fall semester *Can serve as a G2 required MATH course / † Can serve as a non-BIOL G2 course *Note: Student will need to wait until the end of registration to enroll in >17 credits, or one of these courses could be completed during Winter or Summer Note: The perspectives course (P) is waived for BSE program.	EDSE	435	Teaching of Science	κl			
*Students should take the Pre-Professional Skills Tests (PPST) the 1st semester of freshman year. *CHEM 235, BIOL 473, and EDSE 435 are only offered in the Fall semester *Can serve as a G2 required MATH course / † Can serve as a non-BIOL G2 course *Note: Student will need to wait until the end of registration to enroll in >17 credits, or one of these courses could be completed during Winter or Summer Note: The perspectives course (P) is waived for BSE program.			TOTAL S.H.	91		TOTAL S.H.	12
*Students should take the Pre-Professional Skills Tests (PPST) the 1st semester of freshman year. *CHEM 235, BIOL 473, and EDSE 435 are only offered in the Fall semester *Can serve as a G2 required MATH course / † Can serve as a non-BIOL G2 course *Note: Student will need to wait until the end of registration to enroll in >17 credits, or one of these courses could be completed during Winter or Summer Note: The perspectives course (P) is waived for BSE program.			***************************************				
^b CHEM 235, BIOL 473, and EDSE 435 are only offered in the Fall semester *Can serve as a G2 required MATH course / ↑ Can serve as a non-BIOL G2 course \$\text{SNote:} Student will need to wait until the end of registration to enroll in >17 credits, or one of these courses could be completed during Winter or Summer Note: The perspectives course (P) is waived for BSE program.	^a Students should	d take the Pre	-Professional Skills Tests (PP	ST) the 1st	semester of	freshman year.	ALALI ADVI LARIOLE ROCIETA PORTANTI LE REMENTE PARTICIPA PURTURA PARTICIPA P
*Can serve as a G2 required MATH course / † Can serve as a non-BIOL G2 course *Note: Student will need to wait until the end of registration to enroll in >17 credits, or one of these courses could be completed during Winter or Summer Note: The perspectives course (P) is waived for BSE program.	^в СНЕМ 235, В	IOL 473, and	i EDSE 435 are only offered i	n the Fall s	emester	Revised 7-8-13	
[§] Note: Student will need to wait until the end of registration to enroll in >17 credits, or one of these courses could be completed during Winter or Summer Note: The perspectives course (P) is waived for BSE program.	*Can serve as a	G2 required	MATH course / † Can serve a	is a non-BI(OL G2 cours	9.	
	[§] Note: Student w		t until the end of registration to e	earoll in >17	credits, or or	ne of these courses could be completed during W	Winter or Summer
	Note: The persu		e (P) is waived for BSE progr	am.			•

		BACE	ŒLOI	R'S DI	EGREE:	BSE			
	,	SAMPLE PROGRAM (12	6 s.h. r	ninim	um) (Les	s Prepare	ed at Admission)		
NOTE: Education	n students n	oust fill out state and federal for the PRAXIS test (required by	orms (C	rimina	l Clearanc	e Acts 34	and 151) EACH year.		
NOTE: THE STUD	int must tak	e the FRAMS lest (required by	y me ri	JE) at 1	east a sen	lester beto	re student teacting,		
FIRS	T SEMES	STER				SECON	D SEMESTER		
BIOL	101	Foundations of Biology	4		BIOL	211	Concepts of Zoology	4	
MATH	101	College Algebra	3		or	221	Concepts of Botany		
ENGL	110	English Composition	3		CHEM	111†	Intro. Chemistry I	4	
G1		Humanities #1	3		MATH	110/160*	Trigonometry/Precalculu	4-6	
WELL	175	Wellness	3		COMM	100	Fundamentals of Speech	3	
PPST		Pre-Professional Skills Test							
		TOTAL S.H.	16				TOTAL S.H.	15-17	
тни	L RD SEME	STER				FOURT	H SEMESTER		
BIOL	,	Concepts of Botany	4		BIOL	1	Cell & Dev. Biology, W	4	
or	 	Concepts of Zoology	- 1	1	BIOL	<u> </u>	Genetics & Molecular	4	
CHEM		Intro. Chemistry II	4	1	ESCI	301	Earth Science, ≥ 200 lev		
EDFN	 	Fdns of Modern Ed	3	1	G1		Literature Course, G1 #2		
EDFN	 	Psyc Fdns Teaching	3		G3		Social Sciences #2	3	
G3	2.11	Social Sciences #1, W	3		03		Social Descrices #2		
05		TOTAL S.H.	17				TOTAL S.H.	7-18 [§]	
		IOIAL S.H.	1/				IUIAL S.A.	7-10	
FIFT	H SEME	STER				SIXTH:	LSEMESTER (Take PRA	XIS)	
CHEM	235 ^b	Short Course Organic Chem.	4		BIOL	343	Ecology & Evolution	4	
PHYS		Physics with Algebra	4		PHYS		Physics with Algebra	4	
G1		Humanities #3, W	3		G3		Social Sciences #3, D	3	
BIOL	375	Biometry	3		ENGL	312 or alt	Advanced Writing (AW)	1	
BIOL		Biology Elective #1	3-4		CHEM		Biochemistry	4	
BIOL	Elective #2	For total of 32 BIOL s.h.	0-1				~~~~~~~~~ <u>~</u>		
		TOTAL S.H.	18 [§]				TOTAL S.H.	18 [§]	
		TOTAL B.H.	7.0				TOTAL D.II.	10	
SEVENTH SE	MESTER	(Last chance to take PRA)	KIS)			EIGHTI	H SEMESTER		
BIOL	473 ^b	Methods Teach Biology	1		EDSC	461	Student Teaching	9	
EDFN 001: EDFN		Issues in Teaching Sec. Ed.	3		EDSE		Differentiated Instruction	<u> </u>	
EDFN 001: EDFN		Instruc. Technology Design							
EDFN 001: EDSE	 	Content Area Literacy	3						
EDFN 001: SPED		Sec. Students w/ Disabilitie					· · · · · · · · · · · · · · · · · · ·		
EDSE	· [Teaching of Science	<u>3</u>				AND THE STATE OF T		
		TOTAL S.H.	16				TOTAL S.H.	12	
		ofessional Skills Tests (PPST) the	1st sem	ester of	freshman y	ear.			
		only offered in the Fall semester TH course / † Can serve as a non-	RIOI G	2 000000	3		Revised 7-8-13		
Note: Student will	need to wait	until the end of registration to enro	oll in >1	7 credits	s, or one of	these cours	es could be completed during \	Winter or	Summer
Note: The perspecti	ves course (I) is waived for BSE program.							

TRSF SEMESTER							MARKET TO THE TOTAL TO THE TOTA	
101 Foundations of Biology 4 BIOL 211 Concepts of Zoology 111 Intro. Chemistry I 4 CHEM 1121 Intro. Chemistry I 1614 Calculuz 155 COMM 1107 Fundamentals of Speech 1101 English Composition 2 COMM 1107 Fundamentals of Speech 1007/4L S.H. 155 COMM 100 Fundamentals of Speech 100% Calculuz 235 Sinor Course Organic Chem 4 CHEM 326 or 375 Biochem I or Environ Chem 100% Cancerpis of Botany 4 BIOL 343 Ecology & Evolution 235 Sinor Course Organic Chem 4 CHEM 326 or 375 Biochem I or Environ Chem 100% Canceral Psychology, G3 # 3 BIOL 385 Principles of Anima Behavior Humanities #1 3 BIOL 385 Principles of Anima Behavior 100% Canceral Psychology, G3 # 3 BIOL 386 Cancera #2 WELL S.H. 14 COTAL S.H. 1707/L.S.H. 1707/L.S.H. 131 Physics I 132 Physics I 132 Physics I 132 Physics I 133 Physics I 134 Physics I	***************************************	The same of the sa	SAMPLE PROGRAM	(120 s.h.	minimum) (V	Vell-Prepa	red at admission)	MANTE LANGE CONTRACT OF THE PROPERTY OF THE PR
101 Foundations of Blology 4 BIOL 211 Concepts of Zoology 111 Intro. Chemistry I 4 WELL 175 Wellness at Global 117 Intro. Chemistry I 161 Calculus 2 COMM 110 English Composition 2 COMM 2 C	FIR		STER		SEC	OND SEMI	STER	
1114 Intro Chemistry I	BIOL	101	Foundations of Biology	4	BIOL	211	Concepts of Zoology	4
161* Caleulus I	CHEM	111	Intro. Chemistry I	4	CHEM	112+	Intro. Chemistry II	4
110 English Composition 3 COMM 100 Fundamentals of Speech	MATH	161*	Calculus I	4	WELL	175	Wellness	3
TOTAL S.H. 15 FOURTH SEMESTER	ENGL	110	English Composition	3	COMM	100	Fundamentals of Speech	3
TITIO SEMESTER FOURTH SEMESTER 225			TOTAL S.H.	15	***************************************		TOTAL S.H.	14
CHEM 343 Ecology & Evolution	THI		STER		FOU	RTH SEM	SSTER	***************************************
CHEM 326 or 375 Biochem Chem 100 [#] Ceneral Psychology, G3 # 3 BIOL 385 Principles of Animal Behavior	1 1		Concepts of Botany	4	BIOL	343	Ecology & Evolution	4
100 ³⁶ General Psychology, G3 # 3 BIOL 385 Principles of Animal Behavior	CHEM	235	Short Course Organic Chem.	4	CHEM	326 or 375	Biochem I or Environ Chem	4
Humanities #1 3 G3 Social Sciences #2, W TOTAL S.H.	PSYC	100 [#]	General Psychology, G3	33	BIOL	385	Principles of Animal Behavior	Ċ.
TOTAL S.H. 14 TOTAL S.H. 14 TOTAL S.H.	G1		Humanities #1	നി	33		Social Sciences #2, W	(C)
SUMMER SESSION 3 SIXTH SEMESTER			TOTAL S.H.	14			TOTAL S.H.	14
SI or 486 Applied Ethol or Behav Ecol 3 SIXTH SEMESTER	IS		ESSION					AA AAN ARWAN SEEDAMEET SEETE SEEDE EEDE SEED S
SIXTH SEMESTER			Applied Ethol or Behav Ecol	ω				***************************************
SIXTH SEMESTER							A-A-6-22/A-MINISTER TO THE THE THE THE THE THE THE THE THE THE	
362 Cell & Devel. Bio, W 4 BIOL 364 Genetics & Molecular		TH SEME	STER		SIX	TH SEME	STER	
131 Physics I 4 PHYS 132 Physics II	BIOL	362	Cell & Devel. Bio, W	4	BIOL	364	Genetics & Molecular	4
131 Physics I	BIOL		Anim Behav Elective #1	3	BIOL	435 or 484	Anim Phys or Mech Anim Behav	3
3 3. Behav. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.	PHYS	131	Physics I	4	PHYS	132	Physics II	4
3 . Behav. 1. <i>I</i>	GI		ا م	3	ENGL		Advanced Writing (AW)	13
3 Behav. 1. M. 235.	Statistics		BIOL 375, MATH 235 or PSYC 211	3				
3. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.			TOTAL S.H.	17			TOTAL S.H.	14
3	SEVE		ESTER		EIGI	ITH SEME	STER	
n. Behav. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.	BIOL		Anim Behav Elective #2	ж	BIOL		Anim Behav Elective #3	3
1. 1. 1. M. 235.	Ъ		Perspectives Course (P)	3	BIOL	472		1-2
<i>I</i> . <i>X</i> 235.	GI	A CARLO COMPANY COMPAN	Humanities #3, W	3	BIOL			0-2
M 235.	G3		Social Sciences #3	3	ELEC		General Electives**	8-10
M 235.	BIOL	***************************************	Practical Experience	1-3				
# PSYC 100 is a required-related course and serves as a G3 course; it is also required for PSYC 211 (statistics elective). CHEM 235 is only offered in the Fall. Students aiming for vet school should take CHEM 231 and 232 in lieu of CHEM 235. Can serve as a non-BIOL G2 course / * Can serve as a MATH G2 course				13-15			TOTAL S.H.	14-16
CHEM 235 is only offered in the Fall. Students aiming for vet school should take CHEM 231 and 232 in lieu of CHEM 235.	# PSYC 100) is a require	d-related course and serves as	a G3 cours	se; it is also req	uired for PS)	(C 211 (statistics elective).	
† Can serve as a non-BIOL G2 course / * Can serve as a MATH G2 course	◆ CHEM 23	5 is only off	ered in the Fall. Students aimin	g for vet s	school should ta	ke CHEM 2	31 and 232 in lieu of CHEM 235.	i
	† Can serve	as a non-BI(OL G2 course / * Can serve as	a MATH (32 course			

	B	BACHELOR OF SCIENCE IN BIOLOGY: ANIMAL BEHAVIOR OPTION	IN BIOL(JGY: ANIM	AL BEHAV	TOR OPTION	
		SAMPLE PROGRAM (120 s.h. minimum) (Less-Prepared at admission)	0 s.h. min	imum) (Less-	Prepared a	t admission)	
FIRST	ST SEMESTER			SEC	SECOND SEM	SEMESTER	
BIOL	101 Foundations of	lations of Biology	4	BIOL	211	Concepts of Zoology	4
GI	Huma	Humanities #1	ж	G3		Social Sciences #1, W	3
MATH	101 College Algebra	ge Algebra	3	MATH	151*	Calculus for Mgmt. & Life Sci.	4
WELL	175 Wellness	ess	33	COMM	100	Fundamentals of Speech	3
ENGL	110 Englis	110 English Composition	æ.			TOTAL S.H.	14
	TOTAL S.H.	L S.H.	91				
THIRD	RD SEMESTER			FOU	FOURTH SEM	SEMESTER	
BIOL	221 Conce	221 Concepts of Botany	4	BIOL	343	343 Ecology & Evolution	4
CHEM	111† Intro. Chemistry I	Chemistry I	4	CHEM	112	112† Intro. Chemistry II	4
PSYC	100 [#] Genera	100 [#] General Psychology, G3 #2	æ	BIOL	385	Principles of Animal Behavior	3
<u>G1</u>	Humai	Humanities #2, D	m	G3		Social Sciences #3	3
	TOTAL S.H.	L S.H.	14			TOTAL S.H.	14
15	STIMMER SESSION						
	ANT AND AND AND AND AND AND AND AND AND AND	1 1 1 1 1 1 1	C				
7018 4	381 or 486 Applie	381 or 486 Applied Ethol or Benay Ecol	2		***************************************		
FIF	FIFTH SEMESTER			SIX	SIXTH SEMESTER	STER	
BIOL	362 Cell &	362 Cell & Devel. Bio, W	4	BIOL	364	364 Genetics & Molecular	4
BIOL	Anim	Anim Behav Elective #1	æ	BIOL	435 or 484	435 or 484 Anim Phys or Mech Anim Behav	3
CHEM	235 ^L Short (Short Course Organic Chem.	4	CHEM	326 or 375	326 or 375 Biochem I or Environ Chem	4
Statistics	BIOL	BIOL 375, MATH 235 or PSYC 211	നി	ENGL		Advanced Writing (AW)	(C)
	TOTA	TOTAL S.H.	14			TOTAL S.H.	14
SEVE	SEVENTH SEMESTER	X		EIG	EIGHTH SEMESTER	SSTER	
BIOL	Anim	Anim Behav Elective #2	3	BIOL		Anim Behav Elective #3	3
Ъ	Perspe	Perspectives Course (P)	3	BIOL	472	Sem. in Biology: An. Beh.	1-2
PHYS	131 Physics I	I 80	4	PHYS	132	132 Physics II	4
BIOL	Practic	Practical Experience	1-3	BIOL	The Control of the Co	For total of 46 BIOL s.h.	0-2
G1	Humai	Humanities #3, W	3	ELEC		General Elective**	3-7
	TOTAL S.H.		14-16			TOTAL S.H.	15-17
[₩] PSYC 100) is a required-relate	* PSYC 100 is a required-related course and serves as a G3 course; it is also required for PSYC 211 (statistics elective)	ourse; it is	also required f	or PSYC 21	l (statistics elective).	
UCHEM 23.	5 is only offered in	UCHEM 235 is only offered in the Fall. Students aiming for vet school should take CHEM 231 and 232 in lieu of CHEM 23	et school sl	hould take CH	EM 231 and	232 in lieu of CHEM 235.	
† Can serve	† Can serve as a non-BIOL G2 course / *	course / * Can serve as a MATH G2 course	H G2 cour	se			
** Credits re	equired as needed to	** Credits required as needed to bring overall total to 120.				Revised 07-24-17	-24-17

SAMPLE PROCRAM (120 s.b.) (Well-Prepared at Admission)		BACHELOR OF SCIENCE IN BIOLOGY: BOTANY OPTION	SCIENCE 1	N BIOLOG	Y: BOTANY	OPTION	
International content International colored Inte		SAMPLE PROC	RAM (120 s.		repared at Ad	(mission)	AND LUCASAN TO THE PROPERTY OF
101 Foundations of Biology 4 BIOL 211 Concepts of Zoology 111 Intro. Chemistry I 4 or CHEM 1.21 Intro. Chemistry II 160* of 161(63)* Precalemates of Speech 3 MATH 161* or other Calculus I or (II, State or CaSCI) 100 Pundamentals of Speech 3 MATH 161* or other Calculus I or (II, State or CaSCI) 101 Pundamentals of Speech 3 ENGL II English Composition II-II 1707AL S.H. 15-16 ENGL ENGL English Composition II-II 221 Concepts of Ecology CHEM 220 Corpanic Chemistry I 221 Concepts of Caclology CHEM 220 Corpanic Chemistry I 221 Concepts of Caclology CHEM 220 Corpanic Chemistry I 231 Organic Chemistry I 4 G3 Social Sciences #1 1707AL S.H. 14 TOTAL S.H. II-II 324 Genetics & Molecular 4 BIOL 343 Ecology & Evolution 325 Flant Systematics 3 BIOL 343 Ecology & Evolution 326 Genetics & Molecular 4 G1 Humanities #2 326 Genetics & Molecular 4 G1 Humanities #3 326 Genetics & Molecular 4 BIOL 343 Ecology & Evolution 327 Biology Elective #1 34 BIOL 456 Plant Physiology 326 Genetics & Molecular 4 G1 Humanities #3 327 Biology Elective #2 3 BIOL Biology Elective #3 327 Biology Elective #4 G1 Humanities #3 328 Biology Elective #4 G1 Humanities #3 329 Chartes #4 G1 Humanities #3 320 Call & Devel Biochemistry I Advanced Writing (AW) 320 Genetics & Molecular Biology Elective #4 G1 Genetics & Molecular 320 Genetics & Molecular Biology Elective #4 G1 Genetics & Molecular 320 Genetics & Molecular Genetics & Molecular 321 Genetics & Molecular Genetics & Molecular 321 Genetics & Molecular Genetics & Molecular	L	FIRST SEMESTER		SEC		TER	
111 Intro. Chemistry 4 or 121 Concepts of Bolany	BIOL	101 Foundations of Biology	4	BIOL	211	Concepts of Zoology	4
160	CHEM	111† Intro. Chemistry I	4	or	221	Concepts of Botany	
MATH 161 ft or other 24	MATH	160* or 161(163)* Precalculus or Calculus		CHEM	112+	Intro. Chemistry II	4
TOTAL S.H 15-16	COMM	100 Fundamentals of Speec		MATH		Calculus I or (II, Stats or CSCI)	3-4
THIRD SEMESTER 15-16 FOURTH SEMESTER 14-15	VALUE OF THE PROPERTY OF THE P			ENGL	110	English Composition	3
THIRD SEMESTER	V	TOŢAL S.H.	15-16		·	TOTAL S.H.	14-15
221 Concepts of Botamy 4 BIOL 362 Cell & Devel. Biology, W	F	THIRD SEMESTER	***************************************	FOL		TER	Madelum for constant Annual States (America de America de Constant
11 Concepts of Zoology CHEM 232 Organic Chemistry I	BIOL	221 Concepts of Botany	4	BIOL	362	Cell & Devel. Biology, W	4
Main Main	OI	211 Concepts of Zoology		CHEM	232	Organic Chemistry II	4
Humanities #1, W = 3 G1 Humanities #2 Humanities #1, W = 3 G1 Humanities #2 Humanities #1, W = 3 G1 TOTAL S.H. FIFTH SEMESTER	CHEM	231 Organic Chemistry I	4	33		Social Sciences #1	3
Humanities #1, W 3 3 14 14 15 15 15 15 15 15	WELL	175 Wellness	æ	GI		Humanities #2	3
FIFTH SEMESTER SIXTH SEMESTER SIXTH SEMESTER 131 Physics I with Algebra 4 BIOL 343 Ecology & Evolution 131 Physics I with Algebra 4 BIOL 343 Ecology & Evolution 132 Physics I with Algebra 4 BIOL 343 Ecology & Evolution 132 Physics I with Algebra 4 BIOL 343 Ecology & Evolution 132 Physics I with Algebra 4 BIOL 436 Plant Physiology 132 Physics I with Algebra 4 BIOL 436 Plant Physiology 132 Physics I with Algebra 4 BIOL 436 Plant Physiology 14	5	anities #1,	33				
SIXTH SEMESTER		TOTAL S.H.	14			TOTAL S.H.	14
131 Physics I with Algebra 4 BIOL 343 Ecology & Evolution 131 Physics I with Algebra 4 PHYS 132 Physics II with Algebra 132 Phant Systematics 3 BIOL 456 Plant Physiclogy 132 Biochemistry I 4 G1 Humanities #3 132 Biochemistry I 4 G1 Humanities #3 133 Biochemistry I 15 ENGL 312 or alt, Advanced Writing (AW) 134 BIOL S.H. 15 EIGHTH SEMESTER 135 Plant Developmental Bio 3 BIOL A70 or 472 Seminar in Biology Elective # 136 Biology Elective # 3 BIOL A70 or 472 Seminar in Biology 147 Biology Elective # 15-16 EIEC General Elective ** 148 Gall Sciences #3, W 3 EIEC General Elective ** 149 Firspectives Course (P) 3 Gall Sciences #3, D 140 Firspectives Course (P) 3 Gall Sciences #3, D 15-16 EIEC General Elective ** 15-16 EIEC General Elective		ORTH SEMESTER		STS	TH SEWEST	TER	
131 Physics I with Algebra		364 Genetics & Molecular	4	BIOL	343	Ecology & Evolution	4
325 Plant Systematics 3 BIOL 4 G1 Humanities #3	PHYS	131 Physics I with Algebra	4	PHYS	132	Physics II with Algebra	4
1 S26 Biochemistry I 4 G1 Humanities #3 ENGL 312 or alt. Advanced Writing (AW) SEVENTH SEMESTER ENGL 312 or alt. Advanced Writing (AW) A29 Plant Developmental Bio 3 BIOL Biology Elective [§] #3 3.4 BIOL Biology Elective [§] #3 3.5 B iology Elective [§] #2 3 BIOL A70 or 472 Seminar in Biology A70 or 472 Seminar in Biology 1. B coial Sciences #2, W 3 BIOL A70 or 472 Seminar in Biology 1. 1. B coial Sciences #2, W 3 G3 General Elective(s)*** 2. B create as a non-BIOL G2 course 15-16 Corral Sciences #3, D 2. B create as a G2 required MATH course 15-16 Course Course (course) 2. B create as a G2 required MATH course ATH Course Course (course) Course (course)<	BIOL	325 Plant Systematics	3	BIOL	436	Plant Physiology	3
FNGL 312 or alt. Advanced Writing (AW) IS IS IS IS IS IS IS I	CHEM	326 Biochemistry I	4	G1		Humanities #3	3
SEVENTH SEMESTER EIGHTH SEMESTER I A29 Plant Developmental Bio 3 BIOL Elective # For total of 45 BIOL s.h. 3 Biology Elective # Biology Elective # BIOL 470 or 472 Seminar in Biology 1- Social Sciences #2, W 3 ELEC General Elective ** 1- Perspectives Course (P) 3 G3 Social Sciences #3, D 2- Perspectives Course (P) 15-16 ELEC General Elective(s)** 2- Serve as a non-BIOL G2 course 15-16 Revised 6-28-13 13-1 Serve as a G2 required MATH course Revised 6-28-13 Revised 6-28-13				ENGL	312 or alt.		33
EVENTH SEMESTER EIGHTH SEMESTER 429 Plant Developmental Bio 3 BIOL Biology Elective [§] #3 Biology Elective [§] #1 3-4 BIOL Elective [§] #4 For total of 45 BIOL s.h. Biology Elective [§] #2 3 BIOL 470 or 472 Seminar in Biology Social Sciences #2, W 3 ELEC General Elective*** Perspectives Course (P) 3 G3 Social Sciences #3, D Brick as a non-BIOL G2 course 15-16 General Elective(s)** Betve as a G2 required MATH course Revised 6-28-13		TOTAL S.H.	15			TOTAL S.H.	17
A 29 Plant Developmental Bio 3 BIOL Biology Elective #3	SE	VENTH SEMESTER	COLLAND ANALOGOUGH ANA	EIG	HTH SEMES	TER	
Serve as a non-BIOL SIDE Anony Elective \$ #1 3-4 BIOL Elective \$ #4 For total of 45 BIOL s.h. Biology Elective \$ #2 3 BIOL 470 or 472 Seminar in Biology Perspectives Course (P) 3 ELEC General Elective*** 13 Perspectives Course (P) 3 G3 Social Sciences #3, D 13 Serve as a non-BIOL Gz course 15-16 TOTAL S.H. 13 Serve as a G2 required MATH course 15-16 Revised 6-28-13 13	BIOL	429 Plant Developmental B		BIOL		Biology Elective [§] #3	3-4
Serial Sciences #2, W 3 BIOL 470 or 472 Seminar in Biology Accial Sciences #2, W 3 ELEC General Elective** Accial Sciences #2, W 3 G3 Social Sciences #3, D Accial Sciences #3, W 15-16 General Elective(s)** 13 Accial Sciences #3, D General Elective(s)** 13	BIOL	Biology Elective [§] #1	3-4	BIOL	Elective [§] #4	For total of 45 BIOL s.h.	3
Social Sciences #2, W	BIOL	Biology Elective [§] #2	3	BIOL	470 or 472		1-2
Course (P) 3 G3 Social Sciences #3, D ELEC General Elective(s)** 13 I5-I6 TOTAL S.H. 13 Revised 6-28-13 Revised 6-28-13	33	Social Sciences #2, W	c.	ELEC			3
ELEC General Elective(s)** 15-16 TOTAL S.H. 13		Perspectives Course (P)	r)	G3		Social Sciences #3, D	3
15-16 TOTAL S.H. Revised 6-28-13				ELEC		General Elective(s)**	2-4
		TOTAL S.H.	15-16			TOTAL S.H.	13-16
	+	District Co. TOID more of the control of the contro					
	*Can ser	ve as a G2 required MATH course					
	§Must be	300-level or above				Revised 6-28-13	The same of the sa

	BACHELOR OF SCIENCE IN BIOLOGY: BOTANY OPTION	ENCE IN	BIOLOGY:	BOTANY OPT	NOI	
	SAMPLE PROGRAM (120 s.h.) (Less Prepared at Admission)	M (120 s.h	.) (Less Prep	ared at Admiss	ion)	
E	FIRST SEMESTER		SEC	SECOND SEMESTER	ER	
BIOL	101 Foundations of Biology	4	BIOL	211	211 Concepts of Zoology	4
MATH	101 College Algebra	3	or	221	221 Concepts of Botany	
ENGT	110 English Composition	3	CHEM	1114	111† Intro. Chemistry I	4
G1	Humanities #1	æ	MATH	110/160*	110/160* Trigonometry/Precalculus	4-6
WELL	175 Wellness Course	3	COMIN	100	100 Fundamentals of Speech	3
	TOTAL S.H.	91			TOTAL S.H.	15-17
HL	THIRD SEMESTER		FOU	FOURTH SEMESTER	ER	
BIOL	221 Concepts of Botany	4	BIOL	362	362 Cell & Devel. Biology, W	4
or	211 Concepts of Zoology		CHEM	231	231 Organic Chemistry I	4
MATH	161† Calculus I	4	G1		Humanities #2	3
CHEM	112† Intro. Chemistry II	4	G3	•	Social Sciences #2,	3
G3	Social Sciences #1, W	33	G1		Humanities #3, W	3
_	TOTAL S.H.	15			TOTAL S.H.	17
LICA	DITOTIT CENATICITIES		STS CITY	darsamas music	q	
74	FIR SEMESTER		770	LIE SEIVIES LE	Y '	
BIOL	364 Genetics & Molecular	4	BIOL	343	343 Ecology & Evolution	4
CHEM	232 Organic Chemistry II	4	<u>a</u>	***************************************	Perspectives Course (P)	3
PHYS	131 Physics I with Algebra	4	PHYS	132	Physics II with Algebra	4
BIOL	325 Plant Systematics	<u>(C)</u>	G3		Social Sciences #3, D	ω
	TOTAL S.H.	15			TOTAL S.H.	14
SEV	SEVENTH SEMESTER		EIG	EIGHTH SEMESTER	ER	
BIOL	429 Plant Developmental Bio	3	BIOL	436	436 Plant Physiology	3
CHEM	326 Biochemistry	4	BIOL	Elective§	Elective [§] Biology Elective #3	2-3
BIOL	Elective [§] Biology Elective #1	3-4	BIOL	Elective #48	Elective #48 For total of 45 BIOL s.h.	0-2
BIOL	Elective [§] Biology Elective #2	3-4	ENGL	312 or alt.	Advanced Writing (AW)	m
BIOL	470 or 472 Seminar in Biology	1-2	ELEC		General Elective**	1-2
	TOTAL S.H.	14-17			TOTAL S.H.	9-14
4 700	# Con come so a non BIOI (2)				Pavised 6.78.13	
*Can ser	*Can serve as a G2 required MATH course					
8 Must be	Must be 300-level or above					
** Credit	** Credits required if needed to bring total to 120.					

of Speech of Speech of Speech Solution Biology, W ATH 235 Jution Biology, W AIGEbra AIGEbra Idecular viron. Science #2 rience h) BIOL s.h. ting (AW) #2 or General Elective** ourse (P) Ecology #3 or General Elective** s G3; ECON 207 is a W course s G3; ECON 207 is a W course		BACHELOR OF SCIENCE IN BIOLOGY: Environmental Biology Option	CIENCE IN BIOL	OGY: Envir	onmental Bi	ology Option	
Trender Series Tren	-	SAMPLE PR	OGRAM (120 s.h.) (Well-Prep	ared at Adn	nission)	
101 Founce Chemistry 1 1 1 1 1 1 1 1 1	FIRS	ST SEMESTER		SEC	OND SEME	STER	
Hard Deckrists A	BIOL	101 Foundations of Biology	4	BIOL	211	Concepts of Zoology	4
131 Calculus for Mgmt. & Life Sci. 4 CPEM 1.12 Into. Chemistry II	CHEM	111† Intro. Chemistry I	4	or	221	Concepts of Botany	
161 Calculus 1.21 WeLL 1.75 Welled 1.75 Well	MATH	151* Calculus for Mgmt. & Life Sci.	4	CHEM	112‡	Intro. Chemistry II	4
110 English Composition 13 FOURTH SEMESTER	or	161* Calcufus I		WELL	175	Wellness	3
TOTAL S.H. TOTAL S.H. 15 TOTAL S.H. ENGL	110 English Composition	3	COMM	100	Fundamentals of Speech	3	
The concepts of Belancy BIOL 315 Blonnery or MATH 235		TOTAL S.H.	15			TOTAL S.H.	†I
Main State all BLA	D SEMPSTED			PTH SEME	Long		
2.11 Concepts of December 4 BIOL 371 Blookary A BIOL 372 Blookary A BIOL 372 Blookary A BIOL 372 Blookary A BIOL 372 Blookary A BIOL 372 Blookary A BIOL 372 Blookary A BIOL 372 Blookary A BIOL 372 Blookary A BIOL 372 Blookary A BIOL 372 Blookary A BIOL 374 Blookary A BIOL 374 Blookary A BIOL 374 Blookary A BIOL A BIOL Biology Biolog	TOTAL STREET	SECTION AND A SECTION AND ASSESSMENT OF SECTION AND ASSESSMENT OF SECTION AND ASSESSMENT OF SECTION ASSESSMENT		100		TO THE TOTAL OF THE PARTY OF TH	,
Maintain Maintain	BIOL	221 Concepts of Botany	4	BIOL	375	Biometry or MATH 235	J. A.
Main	5	ALL CULICEPIS OF LOUINEY		TOTAL	C+0	Leavings & Lyoudian	r .
Humanities 1 with Algebra	CHEM	235 ^a Short Course Organic Chem.	4	BIOL	362	Cell & Devel. Biology, W	4
Humanities #1, W 3 15 SIXTH SEMESTER	PHYS	131† Physics I with Algebra	4	PHYS	132	Physics II with Algebra	4
TOTAL S.H. TOTAL S.H. TOTAL S.H.	GI	Humanities #1, W	M)				
SIXTH SEMESTER			15			TOTAL S.H.	15
March Mornello Environ Science #1 3-4 G3f† G3f† Gareits & Molecular Mornello Environ Science #2 G3f† G3f† G3f† Gareits & Mornello Environ Science #2 G3f† G3f† G3f† Gareits & Mornello Environ Science #2 G3f† G3f† G46 Ecosystems Wornello Environ Science #2 G3f† G3f† G46 Ecosystems Wornello Environ Science #2 G3f† G3f* Environ Gareita Esperience Garei	דיםות	n sewestrep		CIV	TH SEMES	T.O.	
346-461 Organismal Blology Course 3 BIOL 364 Genetics & Molecular Mon-BIOL Environ. Science #1 3-4 BIOL 446 Ecosystems, W 1375* Environmental Chemistry 3-4 BIOL 446 Ecosystems, W 140manifes #2, D 448 Ecosystems, W 140manifes #2, D 448 Ecosystems, W 16-17 70 448 Ecosystems, W 16-17 70 70 408 Practical Experience 16-17 70 70 70 70 70 16-18 70 70 70 70 70 16-19 70 70 70 70 70 16-19 70 70 70 70 16-19 70 70 70 70 70 16-19 70 70 70 70 70 16-19 70 70 70 70 70 16-19 70 70 70 70 70 16-19 70 70 70 70 70 16-19 70 70 70 70 70 16-19 70 70 70 70 70 16-19 70 70 70 70 70 16-19 70 70 70 70 70 16-19 70 70 70 70 70 16-19 70 70 70 70 70 16-19 70 70 70 70 70 16-19 70 70 70 70 16-19 70 70 70 70 16-19 70 70 70 16-1	Tara	n Selvica i en		VIC	I II SEIVIES	IEM	
Mon-BiOL Environ. Science #1 3-4 G3†† Non-BiOL Environ. Science #2 Mon-BiOL Environ. Science #1 3-4 BiOL 446 Ecosystems, W Humanities #2, D 1-3 BiOL 446 Ecosystems, W Humanities #2, D 1-3 BiOL 448 Ecosystems, W Humanities #2, D 1-3 BiOL 4-48 Practical Experience Humanities #2, D 1-4 Humanities #2 Humanities #2 Humanities #2 TOTAL S.H 1-4 Humanities #2 AVENTH SEM ISTER 1-4 1-4 AVENTH SEM ISTER 1-4 1-4 Social Science #1 or #3 31 1-4 1-4 Humanities #2 For total of #49 BiOL s.h. 1-4 Humanities #2 For total of #49 BiOL s.h. 1-4 Humanities #2 For total of #49 BiOL s.h. 1-4 Humanities #2 For total of #49 BiOL s.h. 1-4 AVENTH SEM ISTER 1-4 1-4 1-4 Social Science #1 or #3 3-4 1-4 1-4 Humanities #3 1-4 1-4 1-4 AVENTH SEM ISTER 1-4 1-4 1-4 Humanities #3 1-4 1-4 1-4 Humanities #3 1-4 1-4 1-4 Humanities #3 1-4 1-4 1-4 AVENTH SEM ISTER 1-4 1-4 1-4 Humanities #3 1-4 1-4 Humanities #3 1-4 1-4 1-4 1-4 Humanities #3 1-4 1-4 1-4 Humanities #3 1-4 1-4	BIOL	346-461 Organismal Biology Course	c.	BIOL	364	Genetics & Molecular	4
Humanities #7. Evoironmental Chemistry 4 BIOL 446 Ecosystems, W	€3‡‡	Non-BIOL Environ. Science #1	3-4	G3†‡		Non-BIOL Environ. Science #2	3-4
Humanities #2, D	CHEM	375 ^a Environmental Chemistry	4	BIOL	446	Ecosystems, W	3
325-486 Directed Elective in Advanced Ecology 16-17 or 300 Co-op (research) D.	G1	Humanities #2, D	. 3	G1	annian annian	Humanities #3	3
VENTH SEMESTER 16-17 Ort 300 Co-op (research) 14	BIOL	325-486 Directed Elective in Advanced Ecology°	(C)	BIOL	498	Practical Experience	1-3
14 NUMBER STER 14 14 14 15 14 15 14 15 14 15 14 15 14 15 14 15 14 15 14 15 14 15 14 15 14 15 14 15 14 15 14 14			16-17	or	300	Co-op (research)	(1-3)
Second Ecology Second Second Ecology Second Ecology Second Ecology Second Ecolo						TOTAL S.H.	14-17
325-486 Directed Elective in Advanced Ecology 3 BIOL Elective #2 ⁸ For total of 49 BIOL s.h.	SEVEN	VTH SEMESTER					
344 ⁸⁸ Pop & Comm Ecology 3 BIOL Elective #2 ⁸ For total of 49 BIOL s.h.	BIOL	325-486 Directed Elective in Advanced Ecology°	3	EIGI	ITH SEME	STER	
Perspectives Course (P)	BIOL	34488 Pop & Comm Ecology	3	BIOL	Elective #2\$	For total of 49 BIOL s.h.	0-7
Barrier Social Science #2 or General Elective**	or P	Perspectives Course (P)		ENGL	312 or alt.	Advanced Writing (AW)	3
P Perspectives Course (P) or BIOL 34486 Pop & Comm Ecology G3/ELEC Social Science #3 or General Elective** ELEC General Elective(s)** I4 course / †† Only GEOG 281/295 or ECON 102/207 serve as G3; ECON 207 is a W course and 486 (BIOL 325 is recommended). Revised 5-17-17	G3		3	G3/ELEC		Social Science #2 or General Elective**	3
or BIOL 344% Pop & Comm Ecology G3/ELEC Social Science #3 or General Elective*** ELEC General Elective(s)** TOTAL S.H. TOTAL S.H. 14 course / †† Only GEOG 281/295 or ECON 102/207 serve as G3; ECON 207 is a W course and 486 (BIOL 325 is recommended).	BIOL	Biology Elective #1 [§]	3.0	đ	***************************************	Perspectives Course (P)	3
G3/ELEC Social Science #3 or General Elective**	BIOL	472 Environ. Bio. Seminar	1-2	or BIOL	34488	Pop & Comm Ecology	
ELEC General Elective(s)** I4 I4 I6 I6 I6 I6 I7 I7 I7 I7		TOTAL S.H.	13-14	G3/ELEC		Social Science #3 or General Elective**	3
course / †† Only GEOG 281/295 or ECON 102/207 serve as G3; ECON 207 is a W course and 461 and 486 (BIOL 325 is recommended).				ELEC		General Elective(s)**	2-4
*Can serve as a G2 required MATH course / † Can serve as a non-BIOL G2 course / †† Only GEOG 281/295 or ECON 102/207 serve as G3; ECON 207 is a W course and Offered in the Fall or Spring, but not both. *Offered in Fall only / **Offered in the Fall or Spring, but not both. *Organismal biology courses are BIOL 346, 396, 415, 416, 417, 418, 424 and 461 *Directed electives in advanced ecology are BIOL 325, 329, 442, 445, and 486 (BIOL 325 is recommended). *Must be 300-level or above / ** Credits required if needed to bring overall total to 120. *Revised 5-17-17						TOTAL S.H.	14-18
"Offered in Fall only / §§ Offered in the Fall or Spring, but not both. "Organismal biology courses are BIOL 346, 396, 415, 416, 417, 418, 424 and 461 "Directed electives in advanced ecology are BIOL 325, 329, 442, 443, 445, and 486 (BIOL 325 is recommended). SMust be 300-level or above / ** Credits required if needed to bring overall total to 120. Revised 5-17-17	*Can serve		m-BIOL G2 course / ††	Only GEOG 28	1/295 or ECON	102/207 serve as G3; ECON 207 is a W cour	se
nd 461 and 486 (BIOL 325 is recommended). total to 120.	" Offered in	Fall only / 88 Offered in the Fall or Spring. but not bo	if.				
and 486 (BIOL 325 is recommended). total to 120.	Organisma	l biology courses are BIOL 346, 396, 415, 416, 417,	418, 424 and 461				
total to 120.	^c Directed el	lectives in advanced ecology are BIOL 325, 329, 442		IOL 325 is recon	nmended).		
Revised 5-17-17	§Must be 3	00-level or above / ** Credits required if needed to b	ring overall total to 120				
						Revised 5-17-17	
						1 4 7 4 7 4 7 4 7 4 7 4 7 4 7 4 7 4 7 4	

				_			
NOL	STS	FIRST SEMESTER			SECOND SEMESTER	EMESTER	
I ICELA	101	101 Foundations of Biology	4	BIOL	211	211 Concepts of Zoology	4
WELL	175	175 Wellness	3	or	221	Concepts of Botany	
MATH	101	101 College Algebra	3	CHEM	1114	111† Intro. Chemistry I	4
G1		Humanities #1	3	MATH	151*	151* Calculus for Mgmt. & Life Sci.	4
ENGI	110	110 English Composition	3	COMM	100	100 Fundamentals of Speech	E
Y		TOTAL S.H.	91			TOTAL S.H.	15
THI	RD S	THIRD SEMESTER			FOURTH SEMESTER	EMESTER	
BIOL	221	221 Concepts of Botany	4	BIOL	362	362 Cell & Devel. Biology, W	4
or	211	211 Concepts of Zoology		BIOL	343	343 Ecology & Evolution	4
CHEM	112†	112† Intro. Chemistry II	4	G3+†		Non-BIOL Environ. Science #2	3-4
G3††		Non-BIOL Environ. Science #1	3-4	GI		Humanities #2, D	CT AI
G3		Social Science #1, W	ы				
		TOTAL S.H.	14-15			TOTAL S.H.	14-15
FIE	LH S	FIFTH SEMESTER			SIXTH SEN	SEMESTER	
BIOL 346	461	346-461 Organismal Biology Course b	3	BIOL	364	364 Genetics & Molecular	4
PHYS 1	131‡	131† Physics I with Algebra	4	PHYS	132	132 Physics II with Algebra	4
СНЕМ	235ª	235 ^a Short Course in Organic Chem.	4	BIOL	446	446 Ecosystems, W	æ
BIOL	375	375 Biometry or MATH 235	3	G1		Humanities #3, W	(3)
BIOL 325	-486	325-486 Directed Elective in Advanced Ecology°	ଧ	BIOL	498	498 Practical Experience	1-3
		TOTAL S.H.	17	or	300	300 Co-op (research)	(1-3)
						TOTAL S.H.	15-17
SEV	ENJ	SEVENTH SEMESTER					
BIOL 325	-486	325-486 Directed Elective in Advanced Ecology°	3		EIGHTH SI	SEMESTER	
BIOL 3	34488	3448 Pop & Comm Ecology	3	BIOL		Biology Elective #2 [§]	1-3
or		Biology Elective #28	(1-3)	or	34488	344 ^{§§} Pop & Comm Ecology	(3)
G3/ELEC		Social Science #2 or General Elective**	3	BIOL	Elective(s)8#3	Elective(s) $^{\$}#3$ For total of 49 BIOL s.h.	4-0
CHEM	375ª	375a Environmental Chemistry	4	ENGL	312 or alt.	Advanced Writing (AW)	(C)
BIOL	472	472 Environ. Bio. Seminar	1-2	Ъ		Perspectives Course (P)	9
		TOTAL S.H.	12-16	G3/ELEC		Social Science #3 or General Elective**	2-3
				ELEC		General Elective**	0-1
						TOTAL S.H.	6-17
Can serve as a	G2 re	equired MATH course / † Can serve as a no	on-BIOL G	2 course / †† Only G	EOG 281/295 or	*Can serve as a G2 required MATH course / † Can serve as a non-BIOL G2 course / †† Only GEOG 281/295 or ECON 102/207 serve as G3; ECON 207 is a W	W cours
Offered in Fall	l only	^a Offered in Fall only / ^{§§} Offered in the Fall or Spring, but not both.	oth.				
Organismal bic	ology	^b Organismal biology courses are BIOL 346, 396, 415, 416, 417, 418, 424 and 461	, 418, 424	and 461			
Directed electi	ives in	63	2, 443, 445	, and 486 (BIOL 32	is recommended	0.	
§Must be 300-leyel or above,	eyel 0	r above / ** Credits required it needed to bring overall total to 120.	oring overa	II total to 120.			
						C1 C1 G	

								ALAS LANGUAGO AND AND AND AND AND AND AND AND AND AND
	***************************************	SAMPL	E PROG	RAM (120 s.	SAMPLE PROGRAM (120 s.h. minimum) (Well-prepared at admission)	lmission)		
		THE SHAPE SHAPE						
	FIRST SEMESTER	A CONTRACTOR OF THE PROPERTY O	,	SECC	SECOND SEMESTER	•		NADAWAYA MARAAMAA MARAAMAA MA
BIOL	101	101 Foundations of Biology	4	BIOL	211 Concepts of Zoology	4	LULL LULL LULL LULL LULL LULL LULL LUL	
CHEM	111	111† Intro. Chemistry I	4	CHEM	112† Intro. Chemistry II	4		
MATH	160	160 Precalculus	4	MATH	161 Calculus I	4		
ENGT	110	110 English Composition	33	COMM	100 Fund. of Speech	മി		
		TOTAL S.H.	15-16		TOTAL S.H.	14-15		
	Garsawas danar	QAL		alloa	DITOTH SEMPSTED			STIMMER SESSION ^c
1	Jamas W.	Comment of the commen	_	1010	242 Leadon, & Dealistica		or Tord	005 Moring Investigation
BIOL	177	221 Concepts of Botany	t	BIOL	ક		+	o intarine mivericorates
BIOL	291	291 ^d Marine Biology	4	BIOL	375 Biometry	3	BIOL 39	396 Marine Ichthyology
CHEM	235	235 ^a Short Course in Organic Chem.	4	G3	Social Sciences #1	3		
WELL	175	175 Wellness	<i>(C)</i>	ESCI	261† Intro. Oceanography	41		A Laboratorial Control of the Contro
		TOTAL S.H.	15		TOTAL S.H.	14		TOTAL S.H.
	FIFTH SEMESTER	MESTER		SIX	SIXTH SEMESTER		SUMIN	SUMMER SESSION°
BIOL	362	362 Cell & Devel. Biol., W	4	BIOL	364 Genetics & Molecular	4	BIOL	Biological Oceanography
PHYS	131	131 Physics I with Algebra	4	PHYS	132 Physics II with Algebra	4		
CHEM 375a or	·G1	Chem. Elective or Humanities #1	3-4	ESCI 363 or	G1 Chem. Elective or Humanities #1	3-4		ALL CADOLOGICA COMPANY CONTRACTOR
G3		Social Sciences #2, D	33	G3	Social Sciences #3, W	wl		
		TOTAL S.H.	14-15	WALL VIEW CONTROL OF THE PROPERTY OF THE PROPE	TOTAL S.H.	14		TOTAL S.H.
SEVE	SEVENTH SEMESTER	ESTER		EIGH	EIGHTH SEMESTER		AND A COURSE OF THE PERSON OF	
BIOL	472	472 Marine Biology Seminar	1-2	BIOL	Biology Elective [§] #2	3-4		
BIOL		Biology Elective [§] #1	2-4	Д	Perspectives Course (P)	3		
ENGT		Advanced Writing (AW)	3		General Elective**	3		A Land Control of the
G1		Humanities #2	Э	G1	Humanities #3, W	8		
		General Elective**	3				The state of the s	
	The Application and the Ap	TOTAL S.H.	12-15	A LA ANGUARA NAMARANAM MERINDA	TOTAL S.H.	12-13		A Land Annual An
^a CHEM 235	and CHEN	^a CHEM 235 and CHEM 375 are offered in Fall only; ^b ESCI 363 is offered in Spring of odd years.	'; ESCI	363 is offered	in Spring of odd years.			
c At a marine	field statio	^c At a marine field station, such as the Chincoteague Bay Field Station, Wallops Island VA	Bay Fiel	d Station, Wa	llops Island VA.			
^d BIOL 291,	taken at M	^d BIOL 291, taken at MU, may be replaced by BIOL 290 & BIOL 292, taken in combination,	, 290 & 1	31OL 292, tak	ᄧ	not countin	g as field st	a field station (not counting as field station coursessee footnote c)
*Can serve a	s a G2 requ	*Can serve as a G2 required MATH course / † Can serve as a non-BIOL G2 course	erve as a	non-BIOL G	2 course			The state of the s
§Must be 30	0-level or a	§Must be 300-level or above; must have a total of 47 BIOL s.h.	BIOL s	.h.			W-CA	
7 ++		* * * * * * * * * * * * * * * * * * * *	0				_	PT 10 PT 11

TIRRY SEMESTER SECOND SEMESTER SECOND SEMESTER SECOND SEMESTER SECOND SEMESTER SECOND SEMESTER SECOND SEMESTER SECOND SEMESTER SEMESTER			BA	ACHEL	BACHELOR OF SCIENCE IN BIOLOGY	NCE IN BI	OLOGY MARINE OPTION	TION		-		
FIRST SEMESTER SECOND SEMESTER A BIOL 2011 Charles of Zoology 4 BIOL 2011 Charles of Zoolog			SAME	LE PR	JGRAM (120	s.h. minim	num) (Less prepared at a	dmissio	(ii			
BIOL 101 Foundations of Biology 4 BIOL 211 Concepts of Zoology 4	FIR	STSEME	STER		SECO	ND SEME	STER					
MATH 101 College Algebra 3 MATH 151 Colouins to Nager, 8 116 Colouins to Nager, 8 1 15 Colouins to Nager, 110 English Composition 3 3 3 3 3 3 3 3 3	BIOL	101	Foundations of Biology	4	BIOL	211	Concepts of Zoology	4				
ENGI. 110 English Composition 3 COMM 100 Fund. of Speech 3 Social Sciences #1 1 1 Indumities #1 3 G3 G3 Social Sciences #1 1 Indumities #1 3 G3 G3 Social Sciences #1 1 Indumities #1 1 Indumities #1 1 Indumities #1 1 Indumities #1 Indumities #2 Indumities	MATH	101	College Algebra	3	MATH	151*	Calculus for Mgmt. & Life Sci.	4				
Heart 175 Wellness 3 G3 Social Sciences #1 3	ENGL	110	English Composition	3	COMM	100	Fund. of Speech	3				
Humanities # 3 FOURTH SEMESTER 14 14 15 16 16 16 16 16 16 16	WELL	175	Wellness	3	G3		Social Sciences #1	ကျ				
THIRD SEMBETTER 16 FOURTH SEMBETTER 19 SUIANIER SESSION*	Gí		Humanities #1	3								
THIRD SEMESTER FOURTH SEMESTER SUMMER SESSION*	Line Land of the Land Control of the Land Cont		TOTAL S.H.	91	***************************************		TOTAL S.H.	14				
BIOL 291 ^d Marine Biology 4 BIOL 221 Concepts of Potany 4 BIOL 295 Marine Invertebrates		RD SEME	STER		FOUR	TH SEME	STER		S	UMMER	SESSION ^c	
CHEM	BIOL	291	Marine Biology	4	BIOL	221	Concepts of Botany	4	BIOL		ine Invertebrates	3
BIOL 375 Biometry 3 ESCI 261¢ Intro. Oceanography 4	CHEM	1111	Intro. Chemistry I	4	CHEM	1127	Intro. Chemistry II	4	BIOL	396 Mari	ine Ichthyology	3
G3 Social Sciences #2, D 3 G1 Humanities #2, W 3 CDTAL S.H. TOTAL S.H. IS IS Coll & Devel. Biol., W 4 BIOL Biology Elective* #2 3.4 BIOL Biology Elective* #3 3.4 BIOL BIOL Biology Elective* #3 3.4 BIOL Biology Elective* #3 3.4 BIOL Biology Elective* #3 3.4 BIOL BIOL BIO	BIOL	375	Biometry	3	ESCI	261†	Intro. Oceanography	4				
FIFTH SEMESTER 14 14 15 1707ALS.H. 15 1707ALS.H. 1707A	<u>G3</u>		Social Sciences #2, D	ml	GI		Humanities #2, W	3				
FIFTH SEMESTER SIXTH SEMESTER SIXTH SEMESTER SUMMER SESSION*			TOTAL S.H.				TOTAL S.H.	15		TOT	AL S.H.	9
FIFTH SEMESTER SIVING SIGNATION A BIOL 362 Cell & Devel. Biol. W A BIOL Biological Oceanography												
BIOL 343 Ecology & Evolution 4 BIOL 362 Cell & Devel. Biol., W 4 BIOL Biological Oceanography CHEM 235 ⁸ Short Course in Organic Chem 4 ESCI 363 or GI Cham Electroe or Humanities #3 3.4 Biology Electroe #3 3.4 Biology Electroe #3 3.4 Cham Electroe or Humanities #3 3.4 Cham Electroe or Humanities #3 3.4 Cham Electroe #3 3.4 Cham Electroe #3 3.4 Cham Electroe #3 3.4 Cham Electroe #3 3.4 Cham Electroe #3 3.4 Cham Electroe #3 3.4 Cham Electroe #3 3.4 Cham Electroe #3 3.4 Cham Electroe #3 Cham Electroe #4		FIFTH (SEMESTER		TXIS	H SEMES			S	UMMER	SESSION	
CHEM 235° Slort Course in Organic Chem 4 ESCI 363 or GI Chem. Elective or Humanities #3 3-4 Perspectives (P) 3 BIOL Biology Elective # #1 2-4 BIOL Biology Elective # #2 1-4 TOTAL S.H. SEVENTH SEMESTER 13-15 BIOL TOTAL S.H. TOTAL S.H. TOTAL S.H. SEVENTH SEMESTER 1-2 BIOL General Elective ** 3 TOTAL S.H. BIOL 472 Marine Biology Seminar 1-2 General Elective ** 3 TOTAL S.H. BIOL 364 Genetics & Molecular 4 PHYS 132 Physics II with Algebra 4 PHYS CHEM 375a or GI Chem. Elective or Humanites #3 3-4 PHYS 132 Physics II with Algebra 4 PHYS *** CHEM 235 and CHEM 375 are offered in Fall only; PESCI 363 is offered in Spring of odd years. *** CHEM 225 and CHEM 375 are offered by BIOL 292, taken in combination, at a field station (not counting as field station courses—see foot *** Chem serve as a GZ required MATH course / ↑ Can serve as a non-BIOL 292, taken in combination, at a field station (not counting as field station courses—see foot	BIOL	343	Ecology & Evolution	4	BIOL	362		4	BIOL	Biolo	ogical Oceanography	3
BIOL Biology Elective #1 2-4 BIOL Biology Elective #2 1-4 BIOL Biology Elective #2 1-4 BIOL Biology Elective #2 13-14 TOTAL S.H.	CHEM	235	Short Course in Organic Chem	4	ESCI 363 or G	<u>]</u>	Chem. Elective or Humanities #3	3-4				
BIOL Biology Elective # # 13-15 BIOL Shology Elective # # 13-14 TOTAL S.H. SEVENTH SEMESTER 13-15 TOTAL S.H. TOTAL S.H. TOTAL S.H. SEVENTH SEMESTER 13-15 TOTAL S.H. TOTAL S.H. TOTAL S.H.	ENGL		Advanced Writing (AW)	3	Ъ		Perspectives (P)	3				
SEVENTH SEMESTER FIGHTH SEMESTER TOTAL S.H. TOTAL S.H. TOTAL S.H. SEVENTH SEMESTER EIGHTH SEMESTER TOTAL S.H. TOTAL S.H. BIOL 472 Marine Biology Seminar 1-2 EIGHTH SEMESTER 3 TOTAL S.H. BIOL 364 Genetics & Molecular 4 PHYS 132 Physics II with Algebra 4 PHYS CHEM 375a or Gl Chen. Elective or Humanites #3 3-4 PHYS 132 Physics II with Algebra 4 PHYS CHEM 375a or Gl Chen. Elective or Humanites #3 12-14 TOTAL S.H. 10 PHYS CHEM 375a or Gl Chen. Elective or Humanites #3 12-14 TOTAL S.H. 10 PHYS *CHEM 235 and CHEM 375 are offered in Fall only; PESCI 363 is offered in Spring of odd years. 7 OTAL S.H. 10 PHYS *At a marine field station, such as the Chincoteague Bay Field Station, Wallops Island VA. 4 PHYS 10 PHYS **CHEM 235 and CHEM 375 are offered in Fall only; Pesch as a non-BIOL 292, taken in combination, at a field station (not counting as field station courses—see foot *Can serve as a non-BIOL 292, taken in combination, at a field station (not counting as field station courses—see foot *Can s	BIOL		Biology Elective [§] #1	2-4	BIOL		Biology Elective \$#2	1-4				
SEVENTH SEMESTER BIOL 472 Marine Biology Seminar 1-2 General Elective*** 3 BIOL 364 Genetics & Molecular 4 PHYS 132 Physics II with Algebra 4 PHYS 131 Physics I with Algebra 4 PHYS 132 Physics II with Algebra 4 CHEM 375a or G1 Chan. Elective or Humanites #3 3-4 PHYS 132 Physics II with Algebra 4 CHEM 375a or G1 Chan. Elective or Humanites #3 12-14 TOTAL S.H. 10 10 a CHEM 235 and CHEM 375 are offered in Fall only; b ESCI 363 is offered in Spring of odd years. At a marine field station, such as the Chincoteague Bay Field Station, Wallops Island VA. 10 10 d BIOL 291, taken at MU, may be replaced by BIOL 290 & BIOL 292, taken in combination, at a field station (not counting as field station courses-see foot *Can serve as a G2 required MATH course / † Can serve as a non-BIOL G2 course \$Must be 300-level or above; must have a total of 47 BIOL sh. ** Credits required if needed to bring overall total to 120. ** Credits required if needed to bring overall total to 120. * Revised 7-21-17			TOTAL S.H.	13-15			TOTAL S.H.	13-14		TOT.	'AL S.H.	3
SEVENTH SEMESTER BIOL 472 Marine Biology Seminar 1-2 BIOL 364 General Elective** BIOL 365 General Elective** 374 General Elective** 375 Physics II with Algebra 4 PHYS 374 PHYS 375 O'Gl CHEM 375a o'Gl CHEM 375a o'Gl CHEM 375a o'Gl CHEM 375 are offered in Fall only; bescl 363 is offered in Spring of odd years. 4 CHEM 235 and CHEM 375 are offered in Fall only; bescl 363 is offered in Combination, at a field station, such as the Chincoteague Bay Field Station, Wallops Island VA. 4 BIOL 291, taken at MU, may be replaced by BIOL 292, taken in combination, at a field station (not counting as field station courses-see foot *Can serve as a G2 required MATH course / † Can serve as a non-BIOL G2 course §Must be 300-level or above; must have a total of 47 BIOL s.h. ** Credits required if needed to bring overall total to 120.							7				a La	
BIOL 472 Marine Biology Seminar 1-2 General Elective** 3 BIOL 364 Genetics & Molecular 4 PHYS 132 Physics II with Algebra 4 PHYS CHEM 373a or G1 Chem. Elective or Humanites #3 3-4 PHYS 132 Physics II with Algebra 4 PHYS CHEM 373a or G1 Chem. Elective or Humanites #3 12-14 TOTAL S.H. 10 P CHEM 375a or G1 Chem. Elective or Humanites #3 12-14 TOTAL S.H. 10 P a CHEM 375a or G1 TOTAL S.H. 10 P P P a CHEM 235 and CHEM 375 are offered in Fall only; be SCI 363 is offered in Spring of odd years. P P P c At a marine field station, such as the Chincoteague Bay Field Station, Wallops Island VA. B P P d BIOL 291, taken at MU, may be replaced by BIOL 292 taken in combination, at a field station (not counting as field station courses—see foot *Canser as a G2 required MATH course / † Can serve as a non-BIOL G2 course E E §Must be 300-level or above; must have a total of 47 BIOL sh. ** P **	SEVE	NIH SEN	IESTER		HSIGH	IH SEME	SIER				***************************************	
BIOL 364 Genetics & Molecular 4 PHYS 132 Physics II with Algebra 3 PHYS 131 Physics I with Algebra 4 PHYS 132 Physics II with Algebra 4 CHEM 375a or G1 Chem. Elective or Humanities #3 3-4 PHYS 10 PR CHEM 375a or G1 Chem. Elective or Humanities #3 12-14 TOTAL S.H. 10 PR *CHEM 235 and CHEM 375 are offered in Fall only; PESCI 363 is offered in Spring of odd years. *At a marine field station, such as the Chincoteague Bay Field Station, Wallops Island VA. *At a marine field station, such as the Chincoteague Bay Field Station, Wallops Island VA. *At a marine field station at MU, may be replaced by BIOL 290 & BIOL 292, taken in combination, at a field station (not counting as field station courses-see foot *Can serve as a non-BIOL G2 course **At a serve as a non-BIOL G2 course **At a serve as a non-BIOL S9.** **At a marine field station fineeded to bring overall total to 120. **At a marine field station (not counting as field station courses-see foot **At a marine field station or above; must have a total of 47 BIOL S9.** ***At a marine field station (not counting as field station courses-see foot ***At a marine field station or above; must have a total of 47 BIOL S9.** ***At a marine field station (not counting as field station courses-see foot ***At a marine field station or above; must have a total of 47 BIOL S9.** ****At a marine field station (not c	BIOL	472	Marine Biology Seminar	1-2			General Elective**	3			***************************************	
PHYS 131 Physics I with Algebra 4 PHYS 132 Physics II with Algebra 4 PHYS 13-4 PHYS 12-14 PHY	BIOL	364	Genetics & Molecular	4	23.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1		General Elective**	3				
CHEM 375a or G1 Chem. Elective or Humanities #3 3-4	PHYS	131	Physics I with Algebra	4	PHYS	132	Physics II with Algebra	41				
*CHEM 235 and CHEM 375 are offered in Fall only; bESCI 363 is offered in Spring of odd years. *At a marine field station, such as the Chincoteague Bay Field Station, Wallops Island VA. *BIOL 291, taken at MU, may be replaced by BIOL 290 & BIOL 292, taken in combination, at a field station (not counting as field station coursessee foot *Can serve as a non-BIOL G2 course *Can serve as a G2 required MATH course / † Can serve as a non-BIOL G2 course *Must be 300-level or above; must have a total of 47 BIOL s.h. ** Credits required if needed to bring overall total to 120.	CHEM 37	5a or Gl	Chem. Elective or Humanities #3	3-4								
^a CHEM 235 and CHEM 375 are offered in Fall only; ^b ESCI 363 is offered in Spring of odd years. ^c At a marine field station, such as the Chincoteague Bay Field Station, Wallops Island VA. ^d BIOL 291, taken at MU, may be replaced by BIOL 290 & BIOL 292, taken in combination, at a field station (not counting as field station coursessee foot *Can serve as a G2 required MATH course / † Can serve as a non-BIOL G2 course §Must be 300-level or above; must have a total of 47 BIOL s.h. ** Credits required if needed to bring overall total to 120. ** Revised 7-21-17			TOTAL S.H.	12-14			TOTAL S.H.	10				
** Credits required if needed to bring overall total to 120.	a CHEM	235 and C	HEM 375 are offered in Eall	Hq140	SCI 363 is offe	ered in Spri	ing of odd wears					
d BIOL 291, taken at MU, may be replaced by BIOL 290 & BIOL 292, taken in combination, at a field station (not counting as field station coursessee foot *Can serve as a G2 required MATH course / † Can serve as a non-BIOL G2 course *Must be 300-level or above; must have a total of 47 BIOL s.h. ** Credits required if needed to bring overall total to 120.	c At a mg	rine field	station such as the Chincotes	agne Bay	· Field Station	Wallons Is	land VA					
*Can serve as a G2 required MATH course / † Can serve as a non-BIOL G2 course §Must be 300-level or above; must have a total of 47 BIOL s.h. ** Credits required if needed to bring overall total to 120.	d BIOL 2	.91, taken	at MU, may be replaced by B	310L 29(& BIOL 292,	taken in co	mbination, at a field stati	on (not c	ounting 8	s field stat	tion coursessee for	outc
47 BIOL s.h. to 120.	*Can ser	ve as a G2	required MATH course / † C	Jan serve	as a non-BIOI	L G2 course	(4)					
to 120.	§Must bo	e 300-level	or above; must have a total	of 47 BI	OL s.h.							
	** Credi	ts required	if needed to bring overall tot	tal to 120).						Revised 7-21-17	

		Bachelor of	f Science in	n Biology: M	Bachelor of Science in Biology: Medical Technology	983	
		SAMPLE PROGRAM (120 s.h. minimum) (Well Prepared at admission)	1 (120 s.h.	minimum) (Well Prepared	at admission)	
FIRS	FIRST SEMESTER	TER		SEC	SECOND SEMESTER	TER	
BIOL	101	101 Foundations of Biology	4	BIOL	211	Concepts of Zoology	4
CHEM	111+	111† Intro. Chemistry I	4	CHEM	112‡	112† Intro. Chemistry II	4
G1		Humanities #1	3	MATH	160* or 161(163)*	160* or 161(163)* Precalculus or Calculus I	4-5
COMM	100	100 Fundamentals of Speech	33	ENGL	110	110 English Composition	<u>6</u>
		TOTAL S.H.	14			TOTAL S.H.	15-16
	***************************************			AAAAAAA AAAA AAAA AAAAA AAAAAAAAAAAAAA		A A A A A A A A A A A A A A A A A A A	
	THIRD SEMESTER	STER		FO	FOURTH SEMESTER	TER	
BIOL	257 ^b	257 ^b Intro to Allied Health	1	BIOL	362	362 Cell & Devel. Biol., W	4
CHEM	235 ^b	235 ^b Short Course in Organic Chem	4	BIOL		Biology Elective #2 ^a	3-5
BIOL		Biology Elective #1 ^a	3-5	CHEM	326	326 Biochemistry I	4
G3		Social Sciences #1, W	3	G 3	THE ALL PRINCIPLE OF THE PRINCIPLE OF TH	Social Sciences #2, D	3
WELL	175	Wellness	(C)				
		TOTAL S.H.	14-16		1 - 10-00-00-00-00-00-00-00-00-00-00-00-00-0	TOTAL S.H.	14-16
- VOLTA AND AND AND AND AND AND AND AND AND AN		***************************************				The first terms of the first ter	
FIFT	FIFTH SEMESTER	TER		SI	SIXTH SEMESTER	EK	
BIOL	364	364 Genetics & Molecular	4	BIOL	454 ^b	454 ^b Immunology	2
BIOL	461	461 General Microbiology	Э	BIOL	Elective #3ª	Elective #3 ^a To a total of >8 s.h. BIOL electives	0-2
PHYS	131+	131† Physics I with Algebra	4	ENGL	312 or alt.	Advanced Writing (AW)	3
GI		Humanities #2, W	3	ď		Perspectives Course (P)	3
G3		Social Sciences #3	3	G1		Humanities #3	3
				ELEC		General Elective(s)**	0-4
		TOTAL S.H.	17			TOTAL S.H.	11-17
Clinical y	year is worti	Clinical year is worth 30 transfer credits				All to the second secon	
† Can ser	rve as a non	† Can serve as a non-BIOL G2 course / *Can ser	ve as a G2	*Can serve as a G2 required MATH course	TH course		
^a Recomm	nended Biol	ogy Electives: BIOL 356 (5	s.h.) or BI	JL 254 (4 s.h	.) & BIOL 255 (^a Recommended Biology Electives: BIOL 356 (5 s.h.) or BIOL 254 (4 s.h.) & BIOL 255 (4 s.h.); and BIOL 375 (3 s.h.)	
^b BIOL 2:	57 and CHE	^b BIOL 257 and CHEM 235 offered only in Fall S	Semester; I	310L 454 off	in Fall Semester; BIOL 454 offered only in Spring Semester.	ing Semester.	
** Credit	ts required i	** Credits required if needed to bring overall tota	erall total to 120.			Revised 6-28-13	

		Bachelor o	of Science	Bachelor of Science in Biology: N	Medical Technology	nology	
		SAMPLE PROGRA	M (120 s.)	h. minimum)	(Less prepa	PROGRAM (120 s.h. minimum) (Less prepared at admission)	
FIRST	r Seme	SEMESTER		SECOND	OND SEMESTER	STER	
BIOL	101	101 Foundations of Biology	4	BIOL	211	211 Concepts of Zoology	4
MATH	101	101 College Algebra	3	MATH	110/160*	110/160* Trigonometry/Precalculus	4-6
ENGL	110	110 English Composition	3	CHEM	111‡	111† Intro. Chemistry I	4
G1		Humanities #1	3	COMM	100	100 Fundamentals of Speech	3
WELL	175	175 Wellness	က				
		TOTAL S.H.	91	-		TOTAL S.H.	15-17
THIR	THIRD SEMESTER	STER		FOU	FOURTH SEMESTER	STER	
BIOL	257 ^b	257 ^b Intro to Allied Health		BIOL	362	362 Cell & Devel. Biol., W	4
CHEM	112+	112† Intro. Chemistry II	4	BIOL		Biology Elective #2 ^a	3-5
G1		Humanities #2, W	3	BIOL	364	364 Genetics & Molecular	4
BIOL		Biology Elective #1 ^a	3-5	5		Humanities #3	3
G3		Social Sciences #1, D	3	A CONTRACTOR OF THE PROPERTY O			
		TOTAL S.H.	14-16			TOTAL S.H.	14-16
FIFTE	FIFTH SEMESTER	STER		SIX	SIXTH SEMESTER	TER	
BIOL	461	461 Microbiology	ю	BIOL	454 ^b	454 ^b Immunology	2
PHYS	131*	131† Physics I with Algebra	4	CHEM	326	326 Biochemistry I	4
CHEM	235 ^b	Short Course in Organic Chem	4	ENGT	312 or alt.	Advanced Writing (AW)	3
G3		Social Sciences #2, W	ю	BIOL	Elective #3 ^a	Elective #3 ^a To a total of ≥8 s.h. BIOL electives	0-3
G3		Social Sciences #3	3	P		Perspectives Course (P)	3
	Annual Control of the			ELEC		General Elective**	0
and the state of t		TOTAL S.H.	17	CO-L MANAGEM A MINISTER AND RESIDENCE OF THE SECOND		TOTAL S.H.	12-15
Clinical	year is v	Clinical year is worth 30 transfer credits					
† Can se	rve as a	Can serve as a non-BIOL G2 course / *Can s	serve as a (*Can serve as a G2 required MATH course	ATH course		
^a Recomn	nended .	^a Recommended Biology Electives: BIOL 356 ((5 s.h.) or]	BIOL 356 (5 s.h.) or BIOL 254 (4 s.h.) & BIOL	.h.) & BIOL	255 (4 s.h.); and BIOL 375 (3 s.h.)	· ·
BIOL 2	257 and (^b BIOL 257 and CHEM 235 offered only in Fall Semester; BIOL 454 offered only in Spring Semester	ll Semester	r; BIOL 454 o	ffered only it	Spring Semester.	
** Credi	its requi	** Credits required if needed to bring overall total to 120	otal to 120		11. AVAINGEDAMPARTITESPEERS	Revised 6-28-13	
						ST 64	

	DON	IELOR OF SCIENCE IN	SIOLOGY	: Molecular	Biology/Bio	BACHELOR OF SCIENCE IN BIOLOGY: Molecular Biology/Biotechnology Option	
		SAMPLE PROGRAM (120 s.h.) (Well-Prepared at Admission)	[(120 s.h.)	(Well-Prepa	red at Adn	uission)	
14	FIRST SEMEST	ESTER	***************************************	SEC	SECOND SEMESTER	STER	
BIOL		101 Foundations of Biology	4	BIOL	211	211 Concepts of Zoology	4
CHEM	111+	111† Intro. Chemistry I	4	OT	221	221 Concepts of Botany	
MATH	160* or 161(163)*	163)* Precalculus or Calculus I	4-5	CHEM	112†	112† Intro. Chemistry II	4
COMIM	100	100 Fundamentals of Speech	c	MATH	161† or other	or other Calculus I or (II, Stats or CSCI)	3-4
	***************************************			ENGL	110	110 English Composition	3
	***************************************	TOTAL S.H.	15-16			TOTAL S.H.	14-15
Ë	THIRD SEMEST	ESTER		FOU	FOURTH SEMESTER	STER	
BIOL	221	221 Concepts of Botany	4	BIOL	362	362 Cell & Devel. Biology, W	4
or	211	211 Concepts of Zoology	ALCOLOGY CHARACTER CONTRACTOR CON	CHEM	232	232 Organic Chemistry II	4
CHEM	231	231 Organic Chemistry I	4	PHYS	132	132 Physics II with Algebra	4
PHYS	131	31† Physics I with Algebra	4	G1		Humanities #1	3
WELL	175	175 Wellness	3				
		TOTAL S.H.	15			TOTAL S.H.	15
E	FIFTH SEMEST	ESTER	L. A.	SIX	SIXTH SEMESTER	TER	
BIOL	364	364 Genetics & Molecular	4	BIOL	343	343 Ecology & Evolution	4
CHEM+	326	326 Biochemistry I	4	CHEM+	327	327 Biochemistry II	4
GI		Humanities #2	3	G3		Social Science #2	3
G3		Social Science #1, W	3	ENGL	312 or alt	312 or alt Advanced Writing (AW)	3
- Address - Addr		TOTAL S.H.	14			TOTAL S.H.	14
		A CONTRACTOR AND A CONT				A CANADA	
SEV	SEVENTH SEME	MESTER		EIGHTH	ITH SEMESTER	STER	
BIOL	462	462 Molecular Biology, W	4	BIOL	466	466 Molecular & Cell Techniqu	3
BIOL	Elective	Elective [§] 463, 465 or 467 recommende	3-4	BIOL	472	472 Seminar in Biology (MOL)	1-2
G3		Social Science #3	3	BIOL	Elective	Elective $^{\$}$ 463, 465 or 467 recommended	3-4
G1		Humanities #3	3	BIOL	Elective	For total of 39 BIOL s.h.	0-1
Q		Diversity Course (D)	æ	ELEC		General Elective**	3
				Ъ		Perspectives Course (P)	3
				ELEC		General Elective**	1-3
		TOTAL S.H.	16-17		ALLES AND AND AND AND AND AND AND AND AND AND	TOTAL S.H.	14-17
7		3.34-1.4-4-00					
T Cream	s required it ne	Theairs required it needed to bring total to 120.				A CALL AND A CALL AND	
† Can ser		OL G2 course					
*Can ser	_	required MATH course				Revised 6-28-13	
§Must be	§Must be 300-level or al	or above					

	BA	CHELOR OF SCIENCE IN BIOLOGY: Molecular Biology/Biotechnology Option	IN BIOLOG	Y: Moleculan	r Biology/Bi	otechnology Option	
	And the state of t	SAMPLE PROGRAM (120 s.h.)	VAM (120 s.)	h.) (Less Preg	(Less Prepared at Admission)	mission)	
FIR	FIRST SEMES	STER		SECOND	S	STER	
BIOL	101	Foundations of Biology	4	BIOL	211	211 Concepts of Zoology	4
COMIM	100	Fundamentals of Speech	3	or	221	221 Concepts of Botany	
MATH	101	College Algebra	3	CHEM	111+	111† Intro. Chemistry I	4
WELL	175		3	MATH	110/160*	110/160* Trigonometry/Precalculus	4-6
GI		Humanities #1	3	ENGL	110	110 English Composition	3
		TOTAL S.H.	91			TOTAL S.H.	15-17

HI	THIRD SEMESTER	STER		FOUI	FOURTH SEMESTER	STER	
BIOL	221	Concepts of Botany	4	BIOL	362	Cell & Devel. Biology, W	4
or	211		-	CHEM	231	Organic Chemistry I	4
MATH	161‡		4	Q	TO TO THE TOTAL PARTY OF THE TOT	Diversity Course (D)	3
GI		Humanities #2	3	G3		Social Sciences #1	3
CHEM	112‡	Intro. Chemistry II	41	G1		Humanities #3	m
		TOTAL S.H.	15			TOTAL S.H.	17
FIE	FIFTH SEMESTER	STER		XIS	SIXTH SEMESTER	TER	
BIOL	364	Genetics & Molecular	4	BIOL	343	343 Ecology and Evolution	4
CHEM	232	Organic Chemistry II	4	G3		Social Sciences #3, W	3
PHYS	131	Physics I with Algebra	4	PHYS	132	132 Physics II with Algebra	4
G3		Social Sciences #2	<u>133</u>	BIOL	Elective§	Elective [§] 463, 465 or 467 recommended	3-4
		TOTAL S.H.	15			TOTAL S.H.	14-15
SEVE	SEVENTH SEM	ESTER		EIGE	EIGHTH SEMESTER	STER	:
BIOL	462	Molecular Biology, W	4	BIOL	466	466 Molecular & Cell Technique	3
CHEM	326	Biochemistry I	4	BIOL	472	Seminar in Biology (MOL)	1-2
BIOL	Elective	463, 465 or 467 recommende	3-4	CHEM	327 or 324	327 or 324 Biochem II or Plant Biochem	4
BIOL	Elective§	For total of 39 BIOL s.h.	0-1	<u>A</u>		Perspectives Course (P)	B
ENGL	312 or alt	Advanced Writing (AW)	(C)	ELEC	, in the second	General Elective**	0-2
			***************************************			TOTAL S.H.	11-14
		TOTAL S.H.	14-15				
**************************************	7	3.5					
Credit	The Creditis required I	II needed to oring total to 120.	٥.				
† Can ser	ve as a not	† Can serve as a non-BIOL G2 course	-			Revised 6-28-13	
*Can ser	/e as a G2	*Can serve as a G2 required MATH course					
§Must be	§Must be 300-level or above	or above					

		Bachelor of Science in Biology for Nuclear Medicine Option	in Biolo	gy for Nuc	lear Medicine O	ption	
		SAMPLE PROGRAM (120 s.h. minimum) (Well Prepared at admission)	20 s.h. mi	nimum) (V	Vell Prepared at	admission)	
FIRS	FIRST SEMESTER	TER		SE	SECOND SEMESTER	ER	***************************************
BIOL	101	101 Foundations of Biology	4	BIOL	211	211 Concepts of Zoology	4
CHEM	111	111 [†] Intro. Chemistry I	4	CHEM	112	112 [†] Intro. Chemistry II	4
G1		Humanities #1	æ	MATH	160* or 161(163)*	160* or 161(163)* Precalculus or Calculus I	4-5
COMM	100	100 Fundamentals of Speech	က	ENGT	110	110 English Composition	3
		TOTAL S.H.	14			TOTAL S.H.	15-16
	Gad-Salvas dama	Q.A.A.		9	darsamas madica	Q.Q.L	
	SAMAGE ON			ב ב			
BIOL	257	257 ^a Intro to Allied Health		BIOL	356	356 ^a Functional Human Anatom	5
CHEM	235	235 ^a Short Course in Organic Chem	4	CHEM	326	326 Biochemistry I	4
BIOL	362	362 Cell & Devel. Biol., W	4	BIOL	375	375 Biometry	3
G3		Social Sciences #1	3	G3		Social Sciences #2, W	3
WELL	175	175 Wellness	κl			•	
		TOTAL S.H.	15			TOTAL S.H.	15
	FIFTH SEMESTER	TER	AND AND AND AND AND AND AND AND AND AND	S.	SIXTH SEMESTER	. R	
BIOL	364	364 Genetics & Molecular	7	SAHd	132	132 Physics with Aloehra II	4
PHYS	131		. 4	I UNE	312 or alt	Advanced Writing (AW)	3
GI		Humanities #2, W	3	GI			3
63		Social Sciences #3, D	3	ELEC	A CONTRACTOR OF THE CONTRACTOR	General Elective**	3
P		Perspectives Course (P)	33	ELEC		General Elective**	2-3
	Name of the state	TOTAL S.H.	17			TOTAL S.H.	15-16
\limins1.	from it ree	Clinical wear is worth 28 oradite					
† Control	מינים פינים אינים	The course of a non-DIOI CO course / *Con course of CO nominal MATH contract		NA NA	FU consumo	Downsod 6 10 12	
Call Sci	ve as a mom-	DIOL OZ COUISCI CAN SCI VC A	3 4 04 151	Tar namal	TTT COMISC	TYCATSCA 0-50-10	
^a BIOL 2;	57 and CHE	^a BIOL 257 and CHEM 235 offered only in Fall Semester; BIOL 356 offered only in Spring semester	ester; BI(JL 356 off	ered only in Sprin	g semester	
** Credit	s required i	** Credits required if needed to bring overall total to 120 s.h.	120 s.h.	~~~			
		THE PARTY OF THE P					

	Bachelor of Science in Biology for Nuclear Medicine Option	in Biolo	gy for Nucl	ear Medic	ine Option	
	SAMPLE PROGRAM (120 s.h. minimum) (Less prepared at admission)	0 s.h. m	inimum) (L	ess prepar	ed at admission)	ATTENDED OF THE PARTY OF THE PA
FIRST	SEMESTER		SECO	SECOND SEMESTER	ESTER	
BIOL	101 Foundations of Biology	4	BIOL	211	211 Concepts of Zoology	4
MATH	101 College Algebra	ю	MATH	110/160*	110/160* Trigonometry/Precalculus	4-6
ENGL	110 English Composition	m	CHEM	111	111^\dagger Intro. Chemistry I	4
G1	Humanities #1	3	COMIM	100	100 Fundamentals of Speech	3
WELL	175 Wellness	(C)				
	TOTAL S.H.	91			TOTAL S.H.	15-17
THIRI	THIRD SEMESTER	Manager Manager Commission Commis	FOUR	FOURTH SEMESTER	ESTER	
BIOL	257 ^a Intro to Allied Health	1	BIOL	356ª	356ª Functional Human Anatomy	. 5
CHEM	112 [†] Intro. Chemistry II	4	BIOL	364	364 Genetics & Molecular	4
BIOL	362 Cell & Devel. Biol., W	4	GI		Humanities #3, W	3
G3	Social Sciences #1	n	63		Social Sciences #2	3
G1	Humanities #2, D	ml				
	TOTAL S.H.	15			TOTAL S.H.	15
FIFTE	HETH SEMESTER		LXIS	SIXTH SEMESTER	STER	
PHYS	131 [†] Physics with Algebra I	4	PHYS	132	132 Physics with Algebra II	4
CHEM	235 ^a Short Course in Organic Chem	4	CHEM	326	326 Biochemistry I	4
BIOL	375 Biometry	m	ENGL	12 or alt.	Advanced Writing (AW)	3
G 3	Social Sciences #3, W	ကျ	4		Perspectives Course (P)	3
			ELEC		General Elective**	1-3
	TOTAL S.H.	14			TOTAL S.H.	15-17
Clinical	Clinical year is worth 28 credits	The land of some			Revised 6-28-13	and a decided to consequent the consequence of the
† Can ser	Can serve as a non-BIOL G2 course / *Can serve as a G2 required MATH course	serve as	a G2 require	d МАТН с	ourse	
^a BIOL 2	^a BIOL 257 and CHEM 235 offered only in Fall Semester; BIOL 356 offered only in Spring semester	II Semes	ster; BIOL 3	56 offered	only in Spring semester	
** Credi	** Credits required if needed to bring overall total to 120 s.h.	total to 1	20 s.h.			
					-	

		Bachelo	r of Science	Bachelor of Science in Biology for Pre-Optometry	e-Optometry		
	AND THE RESIDENCE OF THE PROPERTY OF THE PROPE	SAMPLE PROGRA	AM (120 s.h.	RAM (120 s.h. minimum) (Well Prepared at admission)	Prepared at	admission)	
FIRST	FIRST SEMESTER	TER		SEC	SECOND SEMESTER	STER	
BIOL	101	101 Foundations of Biology	4	BIOL	211	211 Concepts of Zoology	4
CHEM	111‡	111† Intro. Chemistry I	4	CHEM	112†	112† Intro. Chemistry II	4
MATH 160*	* or 161(163)*	160* or 161(163)* Precalculus or Calculus I	4-5	MATH	161† or other	161† or other Calculus I or (II, Stats or CSCI)	3-4
COMM	100	100 Fundamentals of Speech	3	ENGL	110	110 English Composition	3
			The state of the s	G1		Humanities #1	33
	***************************************	TOTAL S.H.	15-16			TOTAL S.H.	17-18§
THIRD	THIRD SEMESTER	TER		FO	FOURTH SEMESTER	STER	
PSYC	100	100 General Psychology, G3 #	3	BIOL	362	362 Cell & Devel. Biol., W	4
CHEM	231	231 Organic Chemistry I	4	CHEM	232	232 Organic Chemistry II	4
PHYS	131	131 Physics I with Algebra	4	PHYS	132	132 Physics II with Algebra	4
BIOL	375	375 Biometry	3	WELL	175	175 Wellness	3
G1		Humanities #2, W	6				
		TOTAL S.H.	17			TOTAL S.H.	15

FIFTH	SEMESTER	TER		SI	SIXTH SEMESTER	TER	
BIOL	364	364 Genetics & Molecular	4	CHEM	326	326 Biochemistry I	4
BIOL	461	461 General Microbiology	3	ENGL	312 or alt.	312 or alt. Advanced Writing (AW)	3
P		Perspectives Course (P)	3	G3		Social Sciences #3, D	3
G1		Humanities #3	3	BIOL	472	472 Senior Seminar	1-2
G ₃		Social Sciences #2, W	ωl	ELEC		General Elective(s)**a	3-6
		TOTAL S.H.	91			TOTAL S.H.	15-17
Uinical Yea	ır is wort	Clinical Year is worth 23 credits					
Note: Stude	nt will ne	ed to wait until the end of regi	istration to enr	oll in>17 credits, o	r one of these co	§Note: Student will need to wait until the end of registration to enroll in >17 credits, or one of these courses could be completed during Winter or S	ng Winter or
- Can serve	as a non-	† Can serve as a non-BIOL G2 course / *Can se	serve as a G2 re	G2 required MATH course	urse		
** Credits r	equired it	** Credits required if needed to bring overall to	total to 120.	To the second se		Revised 6-28-13	
BIOL 356 I	unctiona	^a BIOL 356 Functional Human Anatomy (5 s.h.) and/or BIOL 438 Neurobiology (3 s.h.) are recommended.	and/or BIOL	438 Neurobiolog	y (3 s.h.) are re	commended.	

		Bachelor of Science in Biology for Pre-Optometry	cience in	Biology for	Pre-Optor	netry]]
		SAMPLE PROGRAM (120 s.h. minimum) (Less prepared at admission)	120 s.h. m	inimum) (L	ess prepar	ed at admission)	
FIRST	T SEMESTER	TER		SECO	SECOND SEMESTER	STER	
BIOL	101	101 Foundations of Biology	4	BIOL	211	Concepts of Zoology	4
MATH	101	101 College Algebra	c	MATH	110/160*	110/160* Trigonometry/Precalculus	4-6
ENGL	110	110 English Composition	3	CHEM	111#	111† Intro. Chemistry I	4
G1		Humanities #1	æ	COMIM	100	100 Fundamentals of Speech	m
WELL	175	175 Wellness	3				
***************************************		TOTAL S.H.	91			TOTAL S.H.	15-17
Tulbu	ON SEMPSTED	O.A.L.		aroa	POIDTH CEMESTED	CTED	
ריאטת	2		,	roor		1.50	T
FSYC	1104	100 General Psychology, G3 #1	3) T	BIOL	706	362 Cell & Devel. Biol., w	4 -
CHEM	1127	1127 Intro. Chemistry II	4	PHYS	152	Physics II with Algebra	4
PHYS	131†	131† Physics I with Algebra	4	CHEM	231	Organic Chemistry I	4
BIOL	375	375 Biometry	m	GI		Humanities #2, D	സി
MATH	161	161 Calculus I	41				
		TOTAL S.H.	18§			TOTAL S.H.	15
FIFT	FIFTH SEMESTER	TER		SIXI	SIXTH SEMESTER	TER	
BIOL	364	364 Genetics & Molecular	4	ENGL	312 or alt.	312 or alt. Advanced Writing (AW)	Э
BIOL	461	461 General Microbiology	co.	CHEM	326	326 Biochemistry I	4
CHEM	232	232 Organic Chemistry II	4	BIOL	472	472 Senior Seminar	1-2
63		Social Sciences #2, W	3	33		Social Sciences #3, W	Э
G1		Humanities #3	3	Ъ		Perspectives Course (P)	3
				ELEC		General Electives**a	0-2
		TOTAL S.H.	17		1	TOTAL S.H.	14-17
Clinical 7	Year is Wo	Clinical Year is Worth 23 credits			No Control		
§Note: Stu	dent will need	Note: Student will need to wait until the end of registration to enroll in >17 credits, or one of these courses could be completed during Winter or	on to enroll	in >17 credits,	or one of the	se courses could be completed du	ring Winter
† Can ser	ve as a nor	† Can serve as a non-BIOL G2 course / *Can serve as a G2 required MATH cours Revised 6-28-13	rve as a G	2 required M	ATH cour	Revised 6-28-13	Constitution of the Consti
** Credit	** Credits required if needed	if needed to bring overall total to 120.	al to 120.	ATT ANABIST ANABISTATION OF THE STATE OF THE			
^a BIOL 35	6 Function	^a BIOL 356 Functional Human Anatomy (5 s.h.) and/or BIOL	and/or BI(OL 438 Neur	.) vgoloido	438 Neurobiology (3 s.h.) are recommended.	
)		

		Bachelor of Science in Biology for Pre-Podiatry	ience in Bio	ology for Pr	e-Podiatry		
		SAMPLE PROGRAM (120 s.h. minimum) (Well Prepared at admission)	s.h. minin	um) (Well	Prepared a	ıt admission)	
FIR	FIRST SEMESTER	TER		SECOND	_	SEMESTER	mental desired and the second
BIOL	101	Foundations of Biology	4	BIOL	211	Concepts of Zoology	4
CHEM	111+	111† Intro. Chemistry I	4	CHEM	112†	112† Intro. Chemistry II	4
MATH	160* or 161(163)*	160* or 161(163)* Precalculus or Calculus I	4-5	MATH	161†	Calculus I	4
COMM	100	100 Fundamentals of Speech	33	ENGL	110	110 English Composition	33
		TOTAL S.H.	15-16			TOTAL S.H.	15
THIRD	IRD SEMESTER	TER		FOURTH		SEMESTER	-
BIOL	257 ^a	257a Intro to Allied Health	,—(BIOL	356 ^a	356 ^a Functional Human Anatomy	5
CHEM	231	231 Organic Chemistry I	4	CHEM	232	232 Organic Chemistry II	4
PHYS	131	131 Physics I with Algebra	4	PHYS	132	132 Physics II with Algebra	4
BIOL	362	362 Cell & Devel. Biol., W	4	WELL	175	175 Wellness	κl
G3		Social Sciences #1	33				
		TOTAL S.H.	91			TOTAL S.H.	91
						A PROPERTY OF THE PROPERTY OF	The state of the s
FIF	FIFTH SEMESTER	TER		SIX	SIXTH SEMESTER	STER	
BIOL	364	364 Genetics & Molecular	4	Ъ		Perspectives Course (P)	3
BIOL	435ª	435 ^a Animal Physiology	æ	ENGT	312 or alt.	or alt. Advanced Writing (AW)	n
G1		Humanities #1	3	G3		Social Science #3, D	n
G3		Social Science #2, W	3	G1		Humanities #2, W	3
CHEM	326	326 Biochemistry	4	G1		Humanities #3	3
				ELEC		General Elective**	1-2
		TOTAL S.H.	17			TOTAL S.H.	16-17
Clinical	Clinical Year is worth 24 credits	1.24 credits					
§Take a (§Take a General Elective for ≥3	ive for ≥3 s.h. if Calculus I requirement has already been completed	equirement	has already	been comp	leted.	
† Can ser	ve as a non-E	Can serve as a non-BIOL G2 course / *Can serve as a G2 required MATH course	e as a G2 re	quired MAT	H course		
^a BIOL 2	57 and BIOL	^a BIOL 257 and BIOL 435 offered only in Fall Semester; BIOL 356 offered only in Spring semester	nester; BIO	L 356 offere	d only in S	pring semester	Modernood a sees on
** Credi	Credits required if needed to	needed to bring overall total to 120	to 120.			Revised 6-28-13	

SAM FIRST SEMESTER OIL 101 Found		ו טכוורוו ו	bachelor of Science in Biology for Fre-Fodiatry	r Fre-Foan	atry	
MESTI 101 For	SAMPLE PROGRAM (120 s.h. minimum) (Less prepared at admission)	(120 s.h.	minimum) (I	ess prepar	ed at admission)	
101 For	ER		SECC	SECOND SEMESTER	STER	
10 4 7	undations of Biology	4	BIOL	2111	211 Concepts of Zoology	4
101 Col	llege Algebra	3	MATH	110/160*	110/160* Trigonometry/Precalculus	4-6
110 Eng	110 English Composition	С	CHEM	111+	111† Intro. Chemistry I	4
Hur	manities #1	n	COMM	100	100 Fundamentals of Speech	m
175 WeJ	liness	നി		THE PROPERTY OF THE PROPERTY O		
TO	TOTAL S.H.	91	TOTAL CONTRACTOR OF THE PROPERTY OF THE PROPER		TOTAL S.H.	5-17
THIRD SEMEST	ER		FOUR	FOURTH SEMESTER	STER	
257 ^a Intr	257 ^a Intro to Allied Health		BIOL	356ª	Functional Human Anatomy	5
362 Cel	Il & Devel. Biol., W	4	PHYS	132	132 Physics II with Algebra	4
112† Intr	112† Intro. Chemistry II	4	CHEM	231	231 Organic Chemistry I	4
131† Phy	ysics I with Algebra	4	B		Social Sciences #1, W	(C)
161 Cal	culus I	41				
TO	TOTAL S.H.	17			TOTAL S.H.	91
			AND AND LOCAL PROPERTY OF THE		A STATE OF THE STA	
FIFTH SEMESTER	ER		SIX	SIXTH SEMESTER	STER	
364 Gen	364 Genetics & Molecular	4	P		Perspectives Course (P)	3
435^{a} Ani	435 ^a Animal Physiology	m	ENGL	312 or alt	312 or alt Advanced Writing (AW)	æ
232 Org	232 Organic Chemistry II	4	G3		Social Sciences #3, W	3
Soc	Social Sciences #2, D	æ	CHEM	326	326 Biochemistry I	4
Hu	Humanties #2	n	G1		Humanities #3	w
TO	TOTAL S.H.	17			TOTAL S.H.	91
Clinical Year is wort	h 24 credits					
Can serve as a non-	BIOL G2 course / *Can serve as a G2 required MATH course	n serve as	a G2 require	d MATH co	urse	
^a BIOL 257 and BIOI	L 435 offered only in Fall Semester; BIOL 356 offered only in Spring semester	'all Semes	ter; BIOL 350	offered or	dy in Spring semester	

CHEM 101 Foundations of Biology 4	FIRST SENDESTER SAMPLE PROCRAM (129 s.h. minimum) (Well Prepared at admission)					Bachelor o	Tocience III T	ыогоду к	Bachelor of Science in Biology for Respiratory Therapy				
CHENCA NUMBER CHENCA NUMBE	PINEST SENDISFIRE Control of the control of the					SAMPLE PROGR	AM (120 s.h.	minimu	m) (Well Prepared at admission)			AA A LANGUS / A KUUTUU A KUUTU	
CREMA 111 Inter-or Related 4 CREMA 112 Inter-or Chemistry II 4	The control of the	F	RST SEMESTE	R				SECON	D SEMESTER				
MATTH STANDARD REAL STANDARD	Common C	BIOL	101	Foundations of Biology	4		Ö	HEM	112† Intro. Chemistry II	4			
Columnic of the Columnic of Speech 2 Col	TOTAL SIN Concentration of Speech 1-6 10 10 10 10 10 10 10 1	CHEM	111	Intro. Chemistry I	4		M	TATH	161† Calculus I	4			
COMMA 100 Fundamentals of Spaces 2-5 2-5 10 Fundamentals of Spaces 2-5 2-5 10 Fundamentals of Spaces 2-5 2-5 10 Fundamentals of Spaces 2-5 2	Tritub Defeated of Speech 2.5 Tritub Defeated of Speech 2.5 Tritub Defeated of Speech 2.5 Tritub Defeated of Speech 2.5 Tritub Defeated De	MATH	160* or 161(163)*	Precalculus or Calculus I	4-5		<u>田</u>	NGL	110 English Composition	3			
TOTAL S.H. 1970 SERVESTING 1970 CHT N.S.M.	TUTILE SEMENTER TOTAL S.H. 19-16 TOTAL S.H. 13-14	COMM	100	Fundamentals of Speech	ы		Ð	7.1	Humanities #1	3			
Process Proc	PHIND SEMESTER				2-16				TOTAL S.H.	13-14			
BIOL 227 Inc. to All other Holland 1 1 1 1 1 1 1 1 1	BIOL Col. # Devel. Blot, W A Col. # Devel. # Devel. # Devel. Blot, W A Col. # Devel. # De	Ţ.	IIRD SEMESTE	SR				FOURT	H SEMESTER			- I LIVI	
PHYS 2315 Stand-curies of Organic Cram 4 GG1 Social Sciences 872 3 Social Sciences 872 3 Social Sciences 81, W 3 Social Sciences 82, Work Experimental Sciences 83, Work Experimental Experimental Sciences 83, Work Experimental Sciences 83, Work Experimental Experimental Experimental Sciences 83, Work Experimental Experimenta	CHEM 235 Stort Course in Organic Chem 4 Well Well-List Stort Stort Algebra 4 Well Well-List Stort Algebra 4 Well Well-List Stort Algebra 4 Well Well-List Stort Stort Algebra 4 Well Well-List Stort Stort Algebra Memoratics #2. D 2 Well Stort Stort Algebra Well Stort Stort Algebra Well Stort Stort Algebra Well Stort Algebra Well Stort Stort Algebra Well St	BIOL	2578	Intro to Allied Health	П		m	TOL	362 Cell & Devel. Biol., W	4			-
Part Part	PHYS 131 Physical valth Algebra 4	CHEM	2358	Short Course in Organic Chem	4		Ö	::3 	Social Sciences #2ª	'n			
Charles State #1, W 2 Ct	Social Sciences #1, W 3 15 15 15 15 15 15 15	PHYS	131	Physics I with Algebra	4		*	VELL	175 Wellness	3			
Charles Humanities #2, D 23 SixTH SEMBSTER SIXT	FIFTH SEMESTER FIFT	C3		Social Sciences #1, W	3		9	31 H	Humanities #3	3			
FIFTH SEMISTER SIGNAR SESSION SINTH SEMISTER SIGNAR SESSION SIGNAR SEGULAR SESSION SIGNAR SEGULAR SE	FILTH SEMESTER SIXTH GI		Humanities #2, D	ξį				A CONTRACTOR AND AN ANALOGO AN ANALOGO AN ANALOGO AN ANTAGO					
FIFTH SEMESTER	BIOL Self-General Microbiology 23 CHEM SIXTH SEMESTER			TOTAL S.H.	15	Westernament and the second se			TOTAL S.H.	13		AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA	
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