Bachelor of Arts Biology

Program Review Report

2007

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The Department of Biological Sciences presents this program evaluation of the Bachelor of Arts Biology (BA Biology degree program falls within the Biology/Biological Sciences, General CIP 26.0101) to the Florida Board of Governors as set forth in Article IX, Section 7, Florida Constitution, Rule 6C-3.001 FAC. The program review and evaluation is a self-report to assess program overall quality and to facilitate improvement in its academic pursuits.

April 2007

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INTRODUCTION and OVERVIEW

Florida Gulf Coast University (FGCU) opened its doors to students in the Fall of 1997 to be a distinguished institution of higher education for the 21st century. Classes were opened with 117 instructional faculty, two academic buildings, a library, a broadcast faculty, three support buildings, and approximately 2500 students. FGCU became Florida's tenth public institution of higher education.

Florida Gulf Coast University will celebrate its tenth anniversary Fall 2007 with an estimated enrollment of 10,000 students. FGCU now has 61 buildings and more than 459 instructional faculty. In the past ten years, FGCU has expanded its infrastructure not only in academic buildings, but with an athletic complex, physical plant, student union, expanded library facility, parking garage, administration building, and student resident housing. It has initiated intercollegiate athletic programs. It has grown to 42 undergraduate degree programs and 20 graduate degree programs.

There are five academic colleges at FGCU including a College of Business, College of Health Professions, College of Professional Studies, College of Education, and College of Arts and Sciences. Within this overall growth, the College of Arts and Sciences reflects 27.3 percent of the declared majors in the University from the Fall 2006 report. The College of Arts and Sciences opened in 1997 with one degree, Bachelor of Arts in Liberal Studies. As the University grew and the College began to expand its degree offerings, a degree of a Bachelor of Arts—Liberal Studies in Biology was instituted in 2003. As of 2006, the degree was designated as a Bachelor of Arts Biology.

The Department of Biological Sciences offers three degree programs, a Bachelor of Arts Biology, Bachelor of Science Biology, and Bachelor of Science Biotechnology. Overall there are 366 majors across the three degree programs with the Bachelor of Arts Biology having 224 declared majors. There are fourteen full-time faculty and three support personnel within the Department of Biological Sciences.

PROGRAM DESCRIPTION

The field of biology encompasses living systems across several levels from molecular to ecological systems. Our Bachelor of Arts Biology degree provides an opportunity that combines a sound science education with a liberal arts interdisciplinary core. In the biology major students have the opportunity to explore the biological sciences across these levels. Students gain an understanding of interactions between organisms and their environments (including especially biomedical and evolutionary perspectives). Ethical complexities of biological research are integrated throughout the curriculum. Pedagogically, emphasis is on lab-centered, hands-on learning rather than the traditional lecture format.

Laboratories are designed to include the latest computer technology and to allow collaborative experimental experiences. Instructors use active learning techniques to allow students to experience and understand biological principles. The biology major includes an emphasis on undergraduate research. Students learn the process of science, and in doing so learn how to learn. Students in the biology major are prepared for entry-level positions and for graduate study in biological sciences, including the various biomedical fields (medical, dental, veterinary, optometry, biochemistry, physiology, microbiology, anatomy, etc.).

Students in the biology major are expected to meet natural science student learning outcomes as well as student learning outcomes specific to the major. For example, students in the biology major are expected to demonstrate:

- Knowledge of biological systems from the molecular, cellular and organismal perspectives, including an historical view of their development.
- A holistic understanding of organismal systems.
- An understanding of ethical complexities of biological research.
- The ability to function effectively and safely in research settings.

Our exceptional faculty are our department foundation. The faculty provide opportunities for students to work with them in directed independent research. Our classroom courses are strengthened by hands-on laboratory experiences within courses in the curriculum. Internship opportunities provide students insight into careers within the community. Student progress through the coursework is strengthened by continued interaction with the biological science faculty.

Faculty members have expertise in specific disciplines to provide a breadth to all areas of biology. All full-time faculty hold a PhD.

Mission Statement

The following are the Mission and Guiding Principles of FGCU to which the Bachelor of Arts Biology degree program adhere.

FGCU Mission

Established on the verge of the 21st century, Florida Gulf Coast University infuses the strengths of the traditional public university with innovation and learning-centered spirit, its chief aim being to fulfill the academic, cultural, social, and career expectations of its constituents. Outstanding faculty uphold challenging academic standards and balance research, scholarly activities, and service expectations with their central responsibilities of teaching and mentoring. Through these efforts, the faculty and University transform students' lives and the southwest Florida region. Florida Gulf Coast University continuously pursues academic excellence, practices and promotes environmental sustainability, embraces diversity, nurtures community partnerships, values public service, encourages civic responsibility, cultivates habits of lifelong learning, and keeps the advancement of knowledge and pursuit of truth as noble ideals at the heart of the university's purpose.

Approved by the FGCU Board of Trustees December 2, 2002.

FGCU Guiding Principles

The founding of Florida Gulf Coast University at the advent of a new century is a signal event. It comes at a moment in history when the conditions that formed and sustained American higher education are fundamentally changing, and at a time when rapid shifts wrought by technology and social complexities are altering the very nature of work, knowledge, and human relationships. As a public institution, Florida Gulf Coast University eagerly accepts the leadership opportunity and obligation to adapt to these changes and to meet the educational needs of Southwest Florida. To do so, it will collaborate with its various constituencies, listen to the calls for change, build on the intellectual heritage of the past, plan its evolution systematically for the twenty-first century, and be guided by the following principles:

Student success is at the center of all University endeavors. The University is dedicated to the highest quality education that develops the whole person for success in life and work. Learner needs, rather than institutional preferences, determine priorities for academic planning, policies, and programs. Acceleration methods and assessment of prior and current learning are used to reduce time to degree. Quality teaching is demanded, recognized, and rewarded.

Academic freedom is the foundation for the transmission and advancement of knowledge. The University vigorously protects freedom of inquiry and expression and categorically expects civility and mutual respect to be practiced in all deliberations.

Diversity is a source of renewal and vitality. The University is committed to developing capacities for living together in a democracy whose hallmark is individual, social, cultural, and intellectual diversity. It fosters a climate and models a condition of openness in which students, faculty, and staff engage multiplicity and difference with tolerance and equity.

Informed and engaged citizens are essential to the creation of a civil and sustainable society. The University values the development of the responsible self grounded in honesty, courage, and compassion, and committed to advancing democratic ideals. Through service

learning requirements, the University engages students in community involvement with time for formal reflection on their experiences. Integral to the University's philosophy is instilling in students an environmental consciousness that balances their economic and social aspirations with the imperative for ecological sustainability.

Service to Southwest Florida, including access to the University, is a public trust. The University is committed to forging partnerships and being responsive to its region. It strives to make available its knowledge resources, services, and educational offerings at times, places, in forms and by methods that will meet the needs of all its constituents. Access means not only admittance to buildings and programs, but also entrance into the spirit of intellectual and cultural community that the University creates and nourishes.

Technology is a fundamental tool in achieving educational quality, efficiency, and distribution. The University employs information technology in creative, experimental, and practical ways for delivery of instruction, for administrative and information management, and for student access and support. It promotes and provides distance and time free learning. It requires and cultivates technological literacy in its students and employees.

Connected knowing and collaborative learning are basic to being well educated. The University structures interdisciplinary learning experiences throughout the curriculum to endow students with the ability to think in whole systems and to understand the interrelatedness of knowledge across disciplines. Emphasis is placed on the development of teamwork skills through collaborative opportunities. Overall, the University practices the art of collective learning and collaboration in governance, operations, and planning.

Assessment of all functions is necessary for improvement and continual renewal. The University is committed to accounting for its effectiveness through the use of comprehensive and systematic assessment. Tradition is challenged; the status-quo is questioned; change is implemented.

Approved by the Deans Council June 18, 1996

Bachelor of Arts Biology Mission

In keeping with the Florida Gulf Coast University Mission and Guiding Principles the following mission for the Bachelor of Arts Biology is provided.

The Bachelor of Arts Biology provides students educational opportunities encompassing molecular, cellular, and organismal areas of study. The degree program produces quality undergraduates who possess a core liberal education coupled with expertise in biology. Graduates are prepared to enter the science community upon graduation in a broad array of careers or continue an education in graduate school and professional programs such as medicine, veterinary science, dentistry, and pharmacy.

Bachelor of Arts Biology Program Goals

The goals of the BA Biology degree program are in concert with the Florida Gulf Coast University Strategic Plan, 2005-2010. They set the momentum for future growth and development of the degree program.

Goal: High Quality Education

FGCU's Vision: Pursue academic excellence to achieve national prominence in undergraduate education and expanding recognition for selected graduate programs.

BA Biology Goal: The 2006 revised BA Biology Curriculum will be implemented, evaluated and assessed to ensure an academic program of excellence for all undergraduate students declaring the BA Biology degree.

Goal: The Student Community

FGCU's Vision: Provide quality educational opportunities serving the region, underrepresented populations, the State of Florida and beyond.

BA Biology Goal: Provide opportunities for the delivery and access of high quality education to all students endeavoring to master the BA Biology curriculum to complete the degree program. Work with FGCU Supplemental Instruction, Outreach Programs, and Adaptive Services.

Goal: A Talented and Dedicated Faculty and Staff

FGCU's Vision: Build a diverse team of exceptional faculty and staff who support the mission and guiding principles of the University.

BA Biology Goal: Engage in a national recruitment for a diverse team of exceptional faculty will continue to support the BA Biology degree program as it continues to grow. Hire talented and committed faculty as the most important assets of a successful degree program. Attract an exceptional faculty with competitive compensation, faculty development opportunities, and the implementation of strategies to retain quality faculty.

Goal: State of the Art Infrastructure

FGCU's Vision: Maintain a state-of-the-art campus that harmonizes with the environment and includes high quality facilities, furnishings, technology, equipment and support services.

BA Biology Goal: Provide state-of-the-art equipment and facilities for the delivery of education to this undergraduate degree program including laboratories and field experiences.

Goal: Research and Sponsored Programs

FGCU's Vision: Foster research and sponsored programs that engage faculty, challenge students and promote public/private academic collaboration.

BA Biology Goal: Offer undergraduate degree students the opportunity to engage in a research experience with faculty mentors. Foster faculty research and scholarly activity by providing available space and opportunities.

Goal: Ongoing Quality Improvement

FGCU's Vision: Implement and sustain an institutional effectiveness model for the University that is based on a culture of assessment, results in continuous improvement, and supports the University in effectively accomplishing its mission.

BA Biology Goal: Maintain continuous improvement in the degree program by yearly assessments including student assessment, curricular reviews, and overall program sustainability.

Student Learning Outcomes

The following are the *Student Learning Outcomes* as set forth by the faculty of the Department of Biological Sciences for the Bachelor of Arts Biology degree program. All *Student Learning Outcomes* are in concert with the FGCU *Mission and Guiding Principles*.

1. Biology students will use knowledge of biological systems from the molecular, cellular, and organismal perspectives in their endeavors. Upon completion of the degree program, students will be able to:
    a. Problem solve by the implementation of the scientific process of forming hypotheses, gathering and critically evaluating information from the literature, the use of technology, employing experimental design in laboratory or field settings, and synthesizing and analyzing information by using numerical and statistical techniques.
    b. Comprehend, evaluate, discuss, and use results from the technical literature.
    c. Engage in effective scientific communication in a professional setting, including technical writing, oral presentations and use of available technology.

2. Biology students will be able to incorporate the interaction between science and society in their lives. Upon completion of the degree program, students will be able to:
    a. Apply ethical practices and behavior in all aspects of biology scientific endeavors and demonstrate the ethical aspects of science, their conduct as a scientist, and their conduct as a citizen.
    b. Approach and solve biological problems critically with scientific literacy in individual and group settings and incorporate a diversity of ideas and approaches.
    c. Engage in aesthetic framework and principles and collaborative projects involving aesthetic awareness and/or analyses.

3. Biology students will emerge from their course of study with an educational foundation of biological systems from the molecular, cellular, and organismal perspectives.

Curriculum

The field of biology encompasses living systems across several levels from molecular to ecological systems. Our Bachelor of Arts Biology degree provides an opportunity that combines a sound science education with a liberal arts interdisciplinary core. In the biology major students have the opportunity to explore the biological sciences across these levels. Students gain an understanding of interactions between organisms and their environments (including especially biomedical and evolutionary perspectives). Ethical complexities of biological research are integrated throughout the curriculum. Pedagogically, emphasis is on lab-centered, hands-on learning rather than the traditional lecture format.

Laboratories are designed to include the latest computer technology and to allow collaborative experimental experiences. Instructors use active learning techniques to allow students to experience and understand biological principles. The biology major includes an emphasis on undergraduate research. Students learn the process of science, and in doing so learn how to learn. Students in the biology major are prepared for entry-level positions and for graduate study in biological sciences, including the various biomedical fields (medical, dental, veterinary, optometry, biochemistry, physiology, microbiology, anatomy, etc.).

The curriculum includes the *Common Prerequisites* set forth by the Florida State University System that provide the foundation of the upper division program.

Bachelor of Arts Biology Degree Requirements

Common Prerequisites

- BSC 1010C General Biology with Lab I (4)
  Acceptable substitutes: PCB X101, X011, X021, X131, BSC X040, 2012
- BSC 1011C General Biology with Lab II (4)
  Acceptable substitutes: ZOO X010C, BOT X010C, BSC X041C, BOT X013C
- CHM 1045C General Chemistry with Lab I (4)
- CHM 1046C General Chemistry with Lab II (4)
- CHM 2210C Organic Chemistry with Lab I (4)
  Acceptable substitutes: PHY X043/X043L, X048/ X048L, X049/X049L or equivalent
- CHM 2211C Organic Chemistry with Lab II (4)
  Acceptable substitutes: PHY X053/X053L, X048/X048L, X049/X049L, or equivalent
- MAC x311 Calculus I (4)
  Acceptable substitutes: MAC 2233, 2253, X281
- MAC x312 Calculus II (4)
  Acceptable substitutes: STA 2122, x014, 2023, x024, x321 or equivalent, MAC x234, x254, x282

NOTE: All combined lecture and laboratory courses (marked with C) are equivalent to taking the lecture and laboratory separately as two courses.

Coursework in the Major

Core courses (16 hours):

- PCB 3063C Genetics (3)
- PCB 3023C Cell Biology (3)
- ZOO 3713C Vertebrate Form & Function (3)
- ISC 3120 Scientific Process (3)
- BSC 4910 Senior Project Research in Biology (2)
- BSC 4911 Sr Project Presentation in Biology (2)

Plus two of the following (2 hours):

- BSC 4933 Current Topics (1)
- EVR 4920 Current Topics (1)
- ISC 4930 Current Topics (1)

Electives: 18 hours from the following:

Molecular Biology

- BCH 3023 Biochemistry (3)
- BCH 3025C Analytical Biochemistry (3)
- BOT 4394C Plant Molecular Biology (3)
- BSC 4422C Methods in Biotechnology (3)
- PCB 4522C Molecular Genetics (3)
- PCB 4783C Cell Membrane Physiology (3)

Cellular Biology

- MCB 3020C General Microbiology (4)
- MCB 4203C Pathogenic Microbiology (3)
- MCB 4507C Virology, Mycology & Parasitology (3)
- PCB 4233C Immunology (3)

Organismal Biology

- BOT 4503 Plant Physiology (3)
- PCB 3xxx Animal Physiology (3)
- PCB 3414C Behavioral Ecology (3)
- PCB 4253C Developmental Biology (3)
- PCB 4674C Reptile-Amphibian Evolution (4)
- ZOO 4436C Evolution of the Mammals (3)

- ZOO 4454C Ichthyology (3)
- ZOO 4472C Ornithology (3)
- ZOO 4480C Mammalogy (3)
- ZOO 4743C Neuroscience (3)
- ZOO 4753C Histology (3)

Other Electives

- BSC 4900 Dir Indep Study/Research Biology (3)
- BSC 4930 Special Topics in Biology (3)
- BSC 4940 Internship in Biology (3)
- EVS 4814 Environmental Toxicology (3)
- PCB 4673 Evolutionary Biology (3)
- XXX 3-4000 Upper division elective from the Environmental Studies or Marine Science Majors

Collegium of Integrated Learning
Complete the following (12 hours):

- IDS 3300 Foundations of Civic Engagement (3)
- IDS 3301 Issues in Culture and Society (3)
- IDS 3303 Issues in Science and Technology (3)
- IDS 4910 Integrated Core Senior Seminar (3)

Additional Requirements

- IDS 3920 University Colloquium (3)

Additional electives may be required to reach a minimum of 120 credit hours for the baccalaureate degree. At least 48 of the 120 hours must be at the upper division (courses numbered 3000 and above). Please also see the Requirements for the Bachelor of Arts Degree earlier in this section.

Course descriptions within the descriptions are found in **Appendix A**. The recommended course progression for the Bachelor of Arts Biology degree program is found in **Appendix B**. This sequencing provides for student degree completion in four years with 120 credit hours.

Assessment

As a basis for assessments conducted at the program level, student outcomes are assessed in the form of an Integrative Program Matrix (IPM) and the Academic Learning Contracts (ALCs) authorized by the State of Florida legislature (See **Appendices C and D** respectively). In addition to established outcomes, since 1999 FGCU academic programs each have an established seven-year cycle for review required by the Board of Governors. To assess the BA Biology degree program assessment strategies include the following:

Assessment of Content/Discipline Knowledge and Skills

Content/discipline knowledge and skills are assessed at the college and departmental levels through:

1. Exams and problem sets completed in the following required courses: BSC 1010C, BSC 1011C Biology I & II, and PCB 3063C Genetics; PCB 3023C Cell Biology; and ZOO 3713C Vertebrate Form & Function.
2. Written proposal and application of technical aspects of research completed in the following required courses: ISC 3120 Scientific Process and BSC 4910 Senior Research in Biology.
3. Oral and written research presentations completed in the following required courses: BSC 4911 Senior Research Presentation in Biology.
4. Research proposals and laboratory or field techniques completed in the following required courses: ISC 3120 Scientific Process and BSC 4910 Senior Research in Biology.
5. Literature reviews and discussion groups completed in the following required course: BSC 4933 Current Topics in Biology.

Assessment of Communication Skills

Communication skills are assessed as part of the General Education Program through papers, exams, and projects completed in ENC 1101 Composition I, ENC 1102 Composition II, and HUM 2510 Understanding the Visual and Performing Arts. Oral and written communication skills are also assessed in the senior capstone course BSC 4911 Senior Research Presentation in Biology and BSC 4933 Current Topics in Biology.

Assessment of Critical Thinking Skills

Critical thinking skills are assessed as part of the General Education Program through papers, exams, and projects completed ENC 1101 Composition I, ENC 1102 Composition II, and HUM 2510 Understanding the Visual and Performing Arts. Critical thinking skills are also assessed in BSC 4933 Current Topics in Biology, the senior capstone courses BSC 4910 Senior Research in Biology and BSC 4911 Senior Research Presentation in Biology.

Program Assessment Plan and Timeline

The BA Biology assesses the effectiveness of the program for continuous improvement through analysis of content/discipline knowledge and skills, communication skills, and critical thinking skills by problem sets, exams, written and oral scientific communication, student feedback, and multi-rater analysis.

Content/Discipline Knowledge and Skills

Assessment of content/discipline knowledge and skills begins with core courses of BSC 1010C, BSC 1011C Biology I & II, and PCB 3063C Genetics; PCB 3023C Cell Biology; and ZOO 3713C Vertebrate Form & Function that set the foundation of knowledge of biological systems from the molecular, cellular, and organismal perspectives. ISC 3120 Scientific Process provides students the beginning of the scientific process of forming a hypotheses, gathering and critically evaluating information from the literature, using technology, employing experimental design in laboratory or field settings, and synthesizing and analyzing information by using numerical and statistical techniques; and comprehending, evaluating, discussing, and using results from the technical literature. BSC 4910 Senior Research Project in Biology and BSC 4911 Senior Research Project Presentation in Biology are the culminating senior courses and the capstone of learning experiences for the Bachelor of Arts degree in Biology.

Assessment of the learning outcomes in content/discipline knowledge and skills is by exams and problem sets, written research proposal, completion of research project under mentor guidance, and presentation of research in oral and poster format to a public audience and scrutiny. Program assessment occurs through multi-rater analysis by course faculty and out-side evaluators assessment of students in each of the content areas using an assessment rubric at the end of each course in the semester.

Effective Communication

BSC 4911 Senior Research Project Presentation in Biology is a culminating senior course for this program goal and the capstone of learning experiences for the Bachelor of Arts degree in Biology.

Assessment of meeting the goal of effective scientific communication is by written research proposal including abstract, introduction, hypothesis, methods and materials, results, and conclusions in technical scientific writing. Presentation of the research occurs in oral and poster format to a public audience and with public scrutiny. Program assessment occurs through multi-rater analysis by course faculty and out-side evaluators assessment of students in each of the content areas using an assessment rubric at the end of each course in the semester.

Critical Thinking and Problem-Solving Abilities

Biology students use knowledge of biological systems from the molecular, cellular, and organismal perspectives in their endeavors. Upon completion of the degree program, students problem solve by the implementation of the scientific process of forming a hypotheses, gathering and critically evaluating information from the literature, using technology, employing experimental design in laboratory or field settings, and synthesizing and analyzing information by using numerical and statistical techniques. This is seen in the senior capstone courses of BSC 4910 Senior Project Research in Biology and BSC 4911 Senior Project Research Presentation in Biology. In the research process, students must use critical thinking and problem-solving abilities to work through the following objectives of these courses.

- *Demonstrate the ability to evaluate and to implement the scientific process, its application in different settings and, creative alternative problem solving approaches that are explored within the context of standard scientific conventions.*
- *Design and conduct a research investigation.*
- *Gather and critically evaluate information including library research skills, experimental design in laboratory or field settings, and the use of technology for gathering information.*

- *Synthesize information via the formation of hypotheses, the use of numerical and statistical techniques, the use of simulation models, and the ability to apply a system approach.*

- *Analyze information.*

Further analysis comes from problem sets, exams, and statistical analysis of measurements across semesters. Program assessment occurs through multi-rater analysis by course faculty and out-side evaluators assessment of students in each of the content areas using an assessment rubric at the end of each course in the semester.

Use of Assessment Findings to Improve Student Learning

Analysis of data is used to promote changes to facilitate consistency in experience for students as well as overall improvement of meeting the learning outcomes. This allows for a highly effective illustration of competence in the level of comprehension and in the demonstration of knowledge of biological systems from the molecular, cellular, and organismal perspectives. Furthermore, mastery of the scientific process to form hypothesis, synthesize scientific information, gather and analyze data, apply statistical techniques is seen. The program assessments provide that students completing the degree have can engage in effective scientific communication as individuals and as team members by listening, speaking, and writing; apply ethical practices and behavior in all aspects of biological scientific endeavors; and can approach and solve biological problems critically with scientific literacy in individual and group settings.

All assessments are completed yearly and provided in the annual report. Any curriculum changes necessitated by assessment outcomes are brought before the faculty and sent forward through the Florida Gulf Coast University Curriculum process. The 2006 assessment is provided in **Appendix E**.

PROGRAM IMPLEMENTATION

The Bachelor of Arts Biology degree program is augmented by its physical and instructional resources, faculty, and students.

Resources

The BA Biology program is supported by the Department of Biological Sciences within the College of Arts and Sciences. The resources are shared across other science disciplines. The FGCU library currently provides access to the basic level of resources necessary for the undergraduate program in biology including monographs (books) and access to 144 journals appropriate to the degree. The library also obtains articles from journals in the biological and health professions fields not available at FGCU through interlibrary loans. These interlibrary loans are currently offered at no charge to faculty and students.

In 1996 FGCU received a $2.5 million grant from the Whitaker Foundation. This gift was matched locally and by the state resulting in the $9.8 million Whitaker Science Center for Science, Mathematics and Technology Education that opened in the spring of 2001. There is a total of 3,000 square feet of research space available to the biology program, to be shared with other programs, in the Whitaker Building. There are 500 square feet of additional space in five rooms for plant/animal facilities. In addition to this dedicated space there are about 6,800 square feet of teaching laboratories in Whitaker Hall and a 410-square foot room for shared large equipment. Laboratory preparation rooms, a walk-in refrigerated room (4º C), a walk-in freezer (-10º C) are also available in the Whitaker building. There are also three science laboratory classrooms in Griffin Hall, which are used for the program.

Many essential pieces of equipment for the biology program are already available and have been purchased with university funds or through externally funded research projects. A detailed list of the equipment currently available is included in **Appendix F**.

It is anticipated that faculty in the biology program will continue to acquire additional equipment through externally funded grants (National Science Foundation, United States Department of Agriculture, National Institute of Health) aimed to improve undergraduate education or for specific research projects.

Faculty

Faculty include members with expertise in specific disciplines to provide a breadth to all areas of biology and all full-time faculty hold a PhD. There are fourteen full-time faculty and three support personnel within the Department of Biological Sciences. Faculty have the expertise to teach non-major biological science courses as well as lower and upper division major courses. The diversity of faculty provides expertise in the courses of the curriculum to offer strong and significant content based not only on text but on experience. Faculty have significant scholarly production and many have external funding for research. They are highly active in service activities at the University, within the College and at the Program level as well. In addition they are active in service professionally and within their communities. See **Appendix G** for a listing of service and scholarly activities for the period May 1, 2005 through April 30, 2006.

Department of Biological Sciences Faculty:
Randall Cross, Associate Professor, Biology/Ecology
Marilyn Cruz-Alvarez, Associate Professor, Molecular Biology/Plant Physiology
Jan DeJarnette, Assistant Professor, Microbiology
Nora Demers, Associate Professor, Biology, Immunology, Interdisciplinary Studies
Alison Elgart, Assistant Professor, Human and Primate Biology/Anthropology
Robert Erdman, Associate Professor, Vertebrate/Invertebrate Biology
Ann Goebel, Assistant Professor, Biology/Environmental Technology
Sharon Isern, Assistant Professor, Biochemistry/Biotechnology
Bette Jackson, Associate Professor, Vertebrate/Behavioral Biology
Scott Michael, Associate Professor, Biochemistry/Biotechnology
Cliff Renk, Professor, Microbiology/Immunology
Martha Rosenthal, Associate Professor, Neuroscience
Tak Ueda, Associate Professor, Molecular Biology/Plant Physiology
Jo Ann Wilson, Professor, Biology/Clinical Diagnostics/Molecular Pathology

Three new full-time faculty will be joining the Department of Biological Sciences Fall 2007 and will support the Bachelor of Arts Biology degree program. The new faculty have the following rank and expertise.

Phillip Allman, Assistant Professor, Oviparous Vertebrate Biology
Charles William Gunnels, Assistant Professor, Behavioral Biology
William Sanders, Assistant Professor, Botany

Currently there are 14 full-time faculty and 3 new lines to be filled Fall 2007. All faculty on permanent lines meet the requirements of the State University System of 12 contact hours per semester. FGCU has designated that full-time faculty members teach a minimum of 9 contact hours per fall and spring semesters unless receiving administrative or other course release. All department faculty meet these criteria. FTE production is very high in the Department of Biological Sciences as the department supports general education science courses such as BSC 1010C Biology I, BSC 1011C Biology II, BSC 1020C Human Systems, and MCB 2010C Microbiology. Fall 2006 enrollment capacity in BSC 1010C/BSC 1011C Biology I & II was 651 students and BSC 1020C Human Systems 162 students. In addition faculty taught 20 upper division courses.

Students

Student growth from 1997 to 2007 has been significant. Overall there are 366 majors across the three degree programs within the Department of Biological Science with the Bachelor of Arts Biology having 224 declared majors. The BA Biology curriculum is rigorous and attrition between lower division and upper division is high. Many students are under-prepared upon arrival to FGCU. Most enter the degree program as freshmen and enroll in Algebra although Calculus is a degree requirement. BSC 1010C General Biology I has high attrition rates for freshmen. This can be attributed to the course rigor, under-prepared students, and students that are not ready to accept responsibility for coursework at the university level. Florida Gulf Coast University has a Supplemental Instruction (SI) program that is a proactive program designed to help students refine study skills. Indications are that participation in SI leads to higher retention and better grades. SI targets historically difficult courses where either 1/3 or more of the students typically earn a D, F, withdraw, or have a high degree of repeating students. These courses are commonly, though not exclusively, introductory courses that large numbers of students take during their freshman and sophomore years. BSC 1010C General Biology I is a targeted course.

In addition, FGCU offers tutoring to students to assist them in becoming independent and confident learners by expanding the skills that fortify a student's self-confidence and success in the academic environment.

Students progress through lower division courses meeting the common prerequisites set forth by the State University System as well as meeting their general education requirements. Students enter the upper division courses in the core curriculum as juniors. Because all faculty teach lower division courses, many students have experiences with faculty that they will encounter during their upper division coursework as well.

Graduates

The Bachelor of Arts biology is a rigorous curriculum. Those students that are successful and complete the degree are highly talented and academically strong. We have had many students that enter professional areas such as dental, medical, veterinary, pharmacy, physician assistant programs and others have pursued graduate education. In addition other graduates have pursued teaching high school science, sought jobs in research, field biology, and forensics. In Spring 2007 there will be 23 Biology graduates. Graduates post-baccalaureate plans are as follows:

Clinical Laboratory	1
County Government	1
Dental School	2 (NOVA, UF)
Graduate School	1 (UF)
Medical School	4 (USF, Virginia Commonwealth, Alabama)
Optometry School	1 (NOVA)
Peace Corps	2
Teaching	1
Veterinary Assistant	1
Veterinary School	1 (UF)
Undecided	8

SWOT ANALYSIS

The SWOT analysis is widely used in higher education and provides a sound infrastructure for strategic planning. The analysis identifies and discusses implications of program strengths and weaknesses, both of which are internally derived and therefore within the institution's control. Opportunities and threats are functions of external environment and therefore, to varying extents, outside of the institution's control.

Strengths

The Bachelor of Arts Biology program has identified the strengths of the program to include

- Recruitment of a strong and diverse faculty
  - The Department of Biological Sciences has selectively recruited a diversified faculty that encompass expertise across the curriculum.
- FGCU support for professional development, promotion, and sabbaticals for faculty.
- Productivity of faculty in service, teaching, and scholarship is very high.
- High quality teaching and instructional activities
  - The State University System Student Assessment Inventory for Fall 2006 provided that the biology faculty overall average assessment of teaching was 4.2. This is a significantly above the mean of 2.5 on a scale of 1 to 5.
- Use of varied and innovative curriculum formats for course delivery
  - The BA Biology degree program courses are delivered in many delivery formats including traditional lecture and separate laboratory courses, integrated laboratory and lecture, and SCALE-UP models.
  - Faculty employ technology including PowerPoint programs, on-line quizzes and information delivery, in class hands-on activities and discussion
- Dedicated support personnel to assist with laboratory instruction delivery
  - Laboratory managers provide preparation and set-up of all biological science laboratories
- Modern classrooms with state-of-the-art technology
  - Podium set-up provides ability for PowerPoint delivery, VizCam capability, DVDs, VCR, and headsets
  - All technology is supported by FGCU instructional technology experts
- Up-to-date and well-equipped teaching laboratories
  - Instrumentation and equipment is maintained and up-dated routinely.
- FGCU provided active recruitment for diversity in the student body
  - Full access for all students provides the BA Biology degree program a diverse student body

Weaknesses

Perceived weaknesses that affect the BA Biology program are

- Rapid growth of the University
  - FGCU has increased student enrollment in 10 years from 2500 to 10,000 students.
  - This has impacted the number of students in the degree program.
  - This impacts the number of sections of courses that need to be offered

- Growth impacts all areas of the University. Paramount to this is the burden of general education
  - In addition to delivering the courses paramount to the BA Biology curriculum as well as the BS Biology and BS Biotechnology degree programs, faculty must accept the responsibility of natural science general education courses for non-science majors.
  - Many of the students in BSC 1010C and BSC 1011C Biology I & II are not biology majors and the rigor of the courses increase the failure and withdraw rates. This not only is inefficient use of resources, but it is depressing to faculty.
- Under-staffed
  - FGCU has provided recruitment opportunities for additional faculty for the past three years, but recruitment lines are not adequate to keep up with the rapid growth in student numbers.
- Insufficient research space
  - Lack of space for faculty research has resulted in insufficient space to support undergraduate research projects and endeavors as required in the curriculum.
- Insufficient number of teaching laboratories/classrooms
  - Lack of classroom teaching laboratories has resulted in the use of more traditional teaching formats of lecture and separate laboratories. This is a divergence from our mission of integrated learning.
- Lop-sided curriculum and faculty
  - The biology curriculum has been predominantly molecular and cellular in nature.
  - There has been a predominance of cellular and molecular faculty hired until Fall 2006

Opportunities

Given the perceived strengths of the BA Biology program, the weaknesses can be overcome providing us opportunities to build upon our assets.

- The strengths within the faculty provide an opportunity to “grow” the biology degree program to national distinction.
- Innovation in instructional delivery provide for students with different learning styles to have opportunities for success.
- An increase in numbers of faculty will allow for the understaffing to diminish with time.
- The construction of a new academic building for the College of Arts and Sciences to house teaching laboratories and research space is slated for Fall 2009. This will help alleviate the space deficiency that we are currently enduring.
- We have an opportunity to develop the biology program into a well-rounded degree encompassing organismal, molecular, and cellular areas for a well-rounded biology degree for all students. Faculty have developed changes in the degree program that will be implemented Fall 2007 to facilitate this opportunity.

Threats

Concerns for the BA Biology degree program center on the rapid growth of the program and over-extension of its faculty.

- Rapid growth of FGCU student population
  - This is paramount to the faculty being pulled to support the non-major natural science general education courses and lower division Biology courses.
  - Infrastructure of the University is not able to sustain the momentum of growth including hiring of adequate number of full-time faculty and adequate number of teaching laboratories.
- Under-prepared students
  - A high percentage of FTIC students lack study skills and maturity to be successful in a University curriculum.
  - Transfer students from community colleges are ill-prepared to advance into upper-division courses successfully.
- Morale of faculty
  - It is difficult for faculty to focus on research and other scholarly activities when they are involved in overloads to support program needs.
  - Faculty participate in multiple service commitments for the University extending themselves beyond reasonable limits.

RECOMMENDATIONS FOR CHANGE

Recommendations for change come from the faculty of the BA Biology degree program. The faculty recommended changes to the degree program to encompass a broader and more encompassing curriculum. Included in the changes are the inclusion of ecology and evolution into the core curriculum choice rather than in the electives. The accepted curriculum changes have been sent forward through the curriculum process at the college and university levels and to the State University System. The changes were accepted and adaptation of the curriculum will commence Fall 2007. The new BA Biology curriculum is provided in **Appendix H**.

In addition the biology faculty discerned where gaps were in the faculty body and designed position descriptions for new faculty hires. Recruitment commenced in the Spring 2007 and new faculty will join us for Fall 2007 including a botanist, behavioral biologist and an oviparous vertebrate biologist. With the addition of these faculty, we are positioned to offer a more extensive biology curriculum.

CONTINUOUS IMPROVEMENT PLANS

The Bachelor of Arts Biology degree program has a continuous improvement plan encompassing the curriculum including assessment of student learning outcomes. Analysis of data is used to promote changes to facilitate consistency in experience for students as well as overall improvement of meeting the learning outcomes. This allows for a highly effective illustration of competence in the level of comprehension and in the demonstration of knowledge of biological systems from the molecular, cellular, and organismal perspectives. Furthermore, mastery of the scientific process to form hypothesis, synthesize scientific information, gather and analyze data, apply statistical techniques is seen. The program assessments provide that students completing the degree have can engage in effective scientific communication as individuals and as team members by listening, speaking, and writing; apply ethical practices and behavior in all aspects of biological scientific endeavors; and can approach and solve biological problems critically with scientific literacy in individual and group settings.

All assessments are completed yearly and provided in the annual report. Any curriculum changes necessitated by assessment outcomes are brought before the faculty and sent forward through the Florida Gulf Coast University curriculum process.

APPENDICES

A. Course Descriptions

B. Recommended Course Sequencing

C. Integrative Program Matrix

D. Academic Learning Compact

E. 2006 Program Assessment

F. Equipment Resources

G. Faculty Service and Scholarship Activities

H. New BA Biology Curriculum and Sequencing

APPENDIX A

Recommended Course Sequencing

COURSES IN THE BIOLOGICAL SCIENCES MAJORS

BCH 3023C - Biochemistry - 3 credit(s)
The biochemistry of proteins, lipids, carbohydrates, and nucleic acids will be investigated. The principles of enzymology, metabolism and bioenergetics will be investigated. The curriculum is inquiry based and fully integrated with a laboratory that emphasizes active learning strategies.
Prerequisite(s): CHM 2211C with a minimum grade of C

BCH 3025C - Analytical Biochemistry - 3 credit(s)
An examination of the aspects of chemical analysis within a sample that has direct biological relevance.
Prerequisite(s): BCH 3023C with a minimum grade of C

BOT 4394C - Plant Molecular Biology - 3 credit(s)
An examination of aspects of molecular biology that apply to the plant kingdom. Plant gene regulation, methods of gene cloning and transformation, and biotechnological applications will be discussed.
Prerequisite(s): PCB 4522C with a minimum grade of C and BOT 2503C with a minimum grade of C

BOT 4503 - Plant Physiology - 3 credit(s)
An overview of the processes that take place in plant cells and organs. Topics include the mechanisms by which plants obtain their nutrients and synthesize required molecules and structures, and the role played by internal and environmental factors in plant growth and development.
Prerequisite(s): BSC 1010C with a minimum grade of C and BSC 1011C with a minimum grade of C and CHM 2211C with a minimum grade of C

BSC 1010C - Gen'l Biology w/Lab I - 4 credit(s)
Intended for science majors. The principles of biology are studied from the molecular to the cellular level. Topics may include basic biochemistry, the cell doctrine, the physical phenomena of life, elementary bioenergetics and biosynthesis, cellular and organismal reproduction and the gene concept. The curriculum is inquiry based and fully integrated with a laboratory that emphasizes active learning strategies.

BSC 1011C - Gen'l Biology w/Lab II - 4 credit(s)
Intended for science majors. Examines biological systems from the organismal level through the system level. Topics may include theory of evolution, biodiversity and systematics, and ecology. The curriculum is inquiry based and fully integrated with a laboratory that emphasizes active learning strategies.

BSC 1020C - Human Systems - 3 credit(s)
The study of the basic principles of human biology intended for non-science majors. Investigates cell biology, reproduction and genetics and human anatomy and physiology including human impacts on ecological systems. The curriculum is inquiry based and fully integrated with a laboratory that emphasizes active learning strategies.

BSC 1930L - Seminar in Medicine I - 1 credit(s)
This course provides a discussion and problem solving format of contemporary topics in medicine with reviews of the literature.

BSC 2930L - Seminar in Medicine II - 1 credit(s)
This course is a continuation of BSC 1930L and provides a discussion and problem-solving format of contemporary topics in medicine with reviews of the literature and volunteer participation in the community as a part of service learning.
Prerequisite(s): BSC 1930L

BSC 3403C - Environmental Quant Techniques - 3 credit(s)
Implementation of laboratory and field techniques for environmental monitoring and analysis. Demonstration of competency with appropriate instrumentation, data management strategies and

statistical procedures.

BSC 3930L - Seminar in Medicine III - 1 credit(s)
This course is a continuation of BSC 2930L and provides a discussion and problem-solving format of contemporary topics in medicine with review of the literature and volunteer opportunity for service learning. (Continued acceptance in the BS Biology Accelerated 3+4 concentration, instructor permission.)
Prerequisite(s): BSC 2930L

BSC 4422C - Methods in Biotechnology - 3 credit(s)
Techniques and applications of biotechnology will be studied with a strong emphasis on laboratory investigation. Recombinant DNA technology will be the focus of study with applications in plant and animal systems. The impacts of biotechnology on society will be examined, such as the human genome project and agricultural biotechnology.
Prerequisite(s): BCH 3023C with a minimum grade of C and PCB 3063C with a minimum grade of C

BSC 4900 - Dir Ind Study/Research in Bio - 2 to 4 credit(s)
Individual study by students under the direction of a faculty mentor. The topic will be selected based on mutual agreement between the student and the faculty mentor.

BSC 4905 - Dir. Ind.Study/Res. Biotech. - 1 to 3 credit(s)
Individual study/research under the direction of a faculty mentor. The topic of study needs to be focused in a Biotechnology area. Permission of the instructor required.

BSC 4910 - Senior Project Research in Bio - 2 credit(s)
Research projects, (or certain aspects of research) are carried out by one or more students under the supervision of a faculty mentor. The project is designed to hone skills in applying research principles and obtaining practice in data collection, analysis. Senior Standing is expected.
Prerequisite(s): PCB 3063C with a minimum grade of C and PCB 3023C with a minimum grade of C or ZOO 3713C with a minimum grade of C

BSC 4911 - Sr Project Presentation in Bio - 2 credit(s)
A continuation of the senior project, students will be expected to prepare and present a summary of their research.
Prerequisite(s): BSC 4910 with a minimum grade of C

BSC 4912 - Senior Seminar in Biology - 3 credit(s)
Students conduct research in scientific teaching methodologies under the supervision of a faculty mentor. The seminar will culminate in the presentation of inquiry-based materials which can be used in the secondary biology classroom.

BSC 4930 - Special Topics in Biology - 2 to 4 credit(s)
Courses will be developed based on topics of current or special interest to students or faculty.

BSC 4933 - Current Topics in Biology - 1 credit(s)
Special sessions exploring the literature in Biological Sciences. Students will receive Satisfactory "S" or Unsatisfactory "U" grades for this course.
Prerequisite(s): ISC 3120

BSC 4940 - Internship in Biology - 2 to 4 credit(s)
An internship provides the student with an opportunity to work on a project in the field or laboratory setting. This work is usually completed off-campus and the student will work with a qualified supervisor at the site as well as a faculty mentor.

BSC 4941 - Internship in Biotechnology - 1 to 3 credit(s)
An internship working on a project in Biotechnology in an external laboratory or industrial setting. The student will work with an external qualified supervisor and with a faculty mentor. Permission of the program director required.

Prerequisite(s): ISC 3120C with a minimum grade of C and BSC 4422C with a minimum grade of C

BSC 4942C - Senior Res. Biotech. - 2 credit(s)
Research project in Biotechnology under the supervision of a faculty mentor. Students will apply experimental design, data collection and analysis. Senior standing is required. Permission of the program director is required.
Prerequisite(s): ISC 3120C with a minimum grade of C and BSC 4422C with a minimum grade of C

BSC 4943 - Sr. Proj. Pres. Biotech. - 1 credit(s)
Presentation of the results of the project carried out in the Senior Research in Biotechnology course.
Prerequisite(s): BSC 4942C

BSC 4944L - Senior Capstone - 3 credit(s)
This senior capstone course provides an undergraduate experience in mentored research and presentation or internship specifically for each BS-Biology student as a culminating experience to the degree program.
Prerequisite(s): PCB 3063C and MCB 3020C and BCH 3023C

EVR 4920 - Current Topics Environ Studies - 1 credit(s)
Special sessions exploring the current issues in Environmental Studies. Topics may vary; they are selected on the basis of what is new or currently relevant in the field.

EVS 4814 - Environmental Toxicology - 3 credit(s)
Ecotoxicology, natural and anthropogenic contaminants, toxicological assessments, bio-indicators, biological effects of contaminants and mechanisms of response inorganisms, properties, transport, fate and effects of various contaminant groups in terrestrial and aquatic environments, risk assessment and remediation efforts.
Prerequisite(s): CHM 1084 or (CHM 1045 with a minimum grade of C and CHM 1045L with a minimum grade of C) or CHM 1045C with a minimum grade of C and (CHM 1046 with a minimum grade of C and CHM 1046L with a minimum grade of C) or CHM 1046C with a minimum grade of C

ISC 3120C - Scientific Process - 3 credit(s)
Introduction to the philosophy, methodology and ethics of scientific practice via classroom discussion and literature review. Focus on philosophical and practical differences between physical & historical science; hypothesis generation and testing; experimental design; construction of a research proposal; composition of a scientific paper; oral presentation; and critical review.
Prerequisite(s): ISC 3145C with a minimum grade of C or BSC 1051C with a minimum grade of C or PCB 3063C with a minimum grade of C or ZOO 3713C with a minimum grade of C and (STA 2023 with a minimum grade of C or STA 2037 with a minimum grade of C) or PCB 3023C with a minimum grade of C

ISC 4930 - Current Top in Intd Nat Science - 1 to 3 credit(s)
Special or current topics in the interdisciplinary natural sciences. Students are encouraged to choose topic courses which are relevant to their prospective research thesis or internship. Students will receive a grade of Satisfactory "S" or Unsatisfactory "U".
Prerequisite(s): ISC 3120C with a minimum grade of C or ISC 3120 with a minimum grade of C

MCB 2010C - Microbiology with Lab - 4 credit(s)
Students study the biology of microorganisms. Structure, physiology and ecology of bacteria, algae, viruses, protozoa and lower fungi will be investigated.
Prerequisite(s): BSC 1010C

MCB 3020C - General Microbiology - 4 credit(s)
A study of the structure, function and genetics of microorganisms, their relationships in natural and controlled environments emphasizing pathogenic bacteria and their hosts. Laboratory includes isolation, identification and culture techniques of microorganisms and their properties.
Prerequisite(s): CHM 2210C and BSC 1010C

MCB 4203C - Pathogenic Microbiology - 3 credit(s)
Biologic basis of infectious disease associated with human microbial infections. Topics include host-parasite relationships, virulence mechanisms and antimicrobial agents. Laboratories cover methods of isolation, detection, enumeration and identification of human pathogenic microorganisms.
Prerequisite(s): MCB 3020C or MCB 2010C

MCB 4507C - Virology Mycology Parasitology - 3 credit(s)
Lecture and laboratory course highlighting medically important viruses, parasites and fungi. Topics include clinical presentation, mechanisms of infection, diagnostic techniques and treatment. Laboratory exercises emphasize culture and identification techniques used to investigate specific human pathogens.
Prerequisite(s): MCB 3020C or MCB 2010C

OCB 4043C - Marine Ecology - 3 credit(s)
Investigates the interactions of biotic (living) and abiotic (nonliving) factors in a marine setting. Diverse environments such as sea grasses, mud flats, coral and mollusk reefs, and the impact of pollution will be examined.
Prerequisite(s): BSC 1011C with a minimum grade of C

OCE 3008C - Oceanography - 3 credit(s)
A systems approach to the study of the world's oceans integrating elements of biological, chemical, geological and physical oceanography. Examination of basic oceanographic principals and processes, with a focus on marine ecosystems of Southwest Florida.
Prerequisite(s): BSC 1010C or BSC 1011C and (CHM 1045 with a minimum grade of C and CHM 1045L with a minimum grade of C) or CHM 1045C with a minimum grade of C

PCB 3023C - Cell Biology - 3 credit(s)
Cellular biochemistry and physiology with in-depth study of prokaryotic and eukaryotic cellular organelles including their morphology and function. Topics include cellular mobility, growth, bioenergetics, division, communication and regulation. The curriculum is inquiry based and fully integrated with a laboratory that emphasizes active learning strategies.
Prerequisite(s): BSC 1010C with a minimum grade of C and (CHM 1045 with a minimum grade of C and CHM 1045L with a minimum grade of C) or CHM 1045C with a minimum grade of C

PCB 3043C - General Ecology - 3 credit(s)
Basic concepts of ecology at population, community, ecosystem, and landscape levels will be studied in integrated lectures, laboratory, and field exercises.

PCB 3063C - Genetics - 3 credit(s)
A study of the principles and theories of heredity including the gene concept, Mendelian and non-Mendelian inheritance. Basic concepts include: the nature, organization, transmission, expression, recombination and function of genetic materials. Principles are derived for genetically characterizing populations. The curriculum is inquiry based and fully integrated with laboratory experiences which emphasize active learning strategies.
Prerequisite(s): (ISC 1005C with a minimum grade of C or BSC 1010C with a minimum grade of C) and (CHM 1045 with a minimum grade of C and CHM 1045L with a minimum grade of C) or CHM 1045C with a minimum grade of C

PCB 3414C - Behavioral Ecology - 3 credit(s)
Key behavioral adaptations of invertebrates and vertebrates to their environments will be studied in integrated lectures, laboratory, and field exercises involving such topics as exploration, habitat selection, feeding, reproduction, and social behavior. The adaptive roles of innate and learned behavior will be discussed in relation to different behaviors.

PCB 3460C - Ecosystem Monit & Research Method - 3 credit(s)
Overview of ecological concepts and basic methods of inventorying, monitoring, and conducting research on terrestrial, freshwater, and marine ecosystems. Emphasis on hands-on experiences. Methods will include those used in describing climatic, chemical, and physical features as well as biotic

features, including field identification. The field emphasis will be on Southwest Florida ecosystems.

PCB 3703C - Human Physiology - 3 credit(s)
Students will study the organs and organ system of the human body as they operate individually and integrate together. Special attention is devoted to cardiovascular, respiratory, neuromuscular, endocrine, renal and reproductive physiology. The curriculum is inquiry based and fully integrated with activities which emphasize active learning strategies and collaboration.
Prerequisite(s): PHY 2054C with a minimum grade of C and CHM 2211C with a minimum grade of C and (ZOO 3713 with a minimum grade of C or BSC 1011C with a minimum grade of C)

PCB 4233C - Immunology - 3 credit(s)
An integrated lecture/laboratory course presenting theory and basic principles of immunology including antigen- antibody reactions immunoglobulin structure, genetics, cellular immunity and immunopathology.
Prerequisite(s): CHM 2211C and BSC 1010C

PCB 4253C - Developmental Biology - 3 credit(s)
Basic developmental principles that are common to many organisms as well as those that are unique to specific organisms will be identified. The molecular mechanisms involved in the development of various eukaryotic organisms including fungi, animals, and plant will be examined.
Prerequisite(s): PCB 4522C with a minimum grade of C or PCB 3023C with a minimum grade of C

PCB 4303C - Limnology - 3 credit(s)
An interdisciplinary approach to the examination of inland waters including lakes, streams, marshes, and swamps. Emphasis on the biotic, chemical and geological components of these aquatic ecosystems using Florida wetlands as models. The course is intended for students with interests in biology, environmental studies, and/or interdisciplinary natural sciences. Permission of instructor.

PCB 4522C - Molecular Genetics - 3 credit(s)
Genetics will be investigated at the molecular level. Gene structure, function, variation, and control will be studied with respect to animal and plant cell structure and function. The curriculum is inquiry based and fully integrated with laboratory experiences which emphasize active learning strategies.
Prerequisite(s): BCH 3023C with a minimum grade of C and PCB 3063C with a minimum grade of C

PCB 4673 - Evolutionary Biology - 3 credit(s)
The application of evolutionary theory to all sub-fields of the biological sciences (e.g., medicine, ecology, molecular biology, etc.). Patterns and processes of evolution are examined, as is evidence, and the history of evolutionary theory. Application of evolutionary theory to problems is stressed, with a further emphasis on the role of phylogeny across biological discipline boundaries.
Prerequisite(s): ZOO 3713C with a minimum grade of C

PCB 4674C - Reptile & Amphibian Evolution - 4 credit(s)
Provides an opportunity for advanced study of the biology of "reptiles" and amphibians in an evolutionary context. The entire spectrum of reptile and amphibian diversity is studied from the first know fossil amphibians and their ancestors through all living and extinct clades. Anatomical, physiological, and behavioral biology are also examined from an evolutionary perspective; utilizing the principles of cladistic analysis, each system is examined from its most primitive condition to the many unique derived conditions found among living and/or fossil amphibians and reptiles. Current controversies may be featured, and topics span from molecular to organismal and ecological. The course will include the use of dissection and physiological laboratory techniques to study various topics.
Prerequisite(s): ZOO 3713C with a minimum grade of C

PCB 4783C - Cell Membrane Physiology - 3 credit(s)
Chemical and physical properties of the plasma membrane. Investigation of plasma membrane biosynthesis and functions in transport and signal transduction. The curriculum is inquiry based and fully integrated with laboratory experiences that emphasize active learning strategies.
Prerequisite(s): BCH 3023C with a minimum grade of C and PCB 3023C with a minimum grade of C

ZOO 3713C - Vertebrate Form and Function - 3 credit(s)
Major anatomical and physiological adaptations of the vertebrates are examined in evolutionary and ecological contexts using integrated lecture and laboratory exercises. The course will include the use of dissection and physiological laboratory techniques to study vertebrate form and function.
Prerequisite(s): ISC 1004C with a minimum grade of C or BSC 1011C with a minimum grade of C

ZOO 4436C - Evolution of the Mammals - 4 credit(s)
Provides an opportunity for advanced study of mammalian biology in its evolutionary context. The entire spectrum of mammalian diversity is studied from the first known fossil mammals through all living and extinct clades. Mammalian anatomy, physiology, and behavior are also examined from an evolutionary perspective; utilizing the principles of cladistic analysis, each system is examined from its most primitive mammalian condition to the many unique derived conditions found among living and/or fossil mammals. Current controversies may be featured, and topics from molecular to organismal and ecological. The course will include the use of dissection and physiological laboratory techniques to study various topics.
Prerequisite(s): ZOO 3713C with a minimum grade of C

ZOO 4454C - Ichthyology - 3 credit(s)
Tracks the rise and evolution of fishes and examines the adaptations in form and function that underlie their success. Emphasis will be placed on Southwest Florida fishes.
Prerequisite(s): BSC 1011C

ZOO 4472C - Ornithology - 3 credit(s)
Evolution, structural and functional adaptations, behavior and ecology of birds. It includes a global overview with emphasis on Florida. Lab emphasizes anatomy, behavior, identification, and ecology. Field trips include study in Florida ecosystems.
Prerequisite(s): BSC 1011C with a minimum grade of C

ZOO 4480C - Mammalogy - 3 credit(s)
Integrated lecture and lab and focuses on the origins and evolution, diversity, structural and functional adaptations, behavior, and ecology of mammals. It present a global overview with an emphasis on Florida mammals. Laboratory will emphasize, anatomy, behavior, identification, and ecology. Field trips will include zoo visits, studies of manatees and other Florida mammals, and an introduction to field research tools in mammalogy.
Prerequisite(s): BSC 1010C with a minimum grade of C and BSC 1011C with a minimum grade of C

ZOO 4743C - Neuroscience - 3 credit(s)
In Neuroscience we will investigate the workings of human nervous systems. We will cover anatomy and physiology, neuropharmacology, and neurological correlates of behaviors such as sleep, emotions, hunger, and sex.
Prerequisite(s): BSC 1010C with a minimum grade of C and CHM 1046C with a minimum grade of C or (CHM 1046 with a minimum grade of C and CHM 1046L with a minimum grade of C) and (PCB 3703C with a minimum grade of C or BSC 1086C with a minimum grade of C)

ZOO 4753C - Histology - 3 credit(s)
A microscopic study of animal tissue covering epithelium, muscle, nervous and connective tissues with an emphasis on the morphological differences in tissue organization both for structural and functional purposes.
Prerequisite(s): ZOO 3713C with a minimum grade of C or BSC 1086C with a minimum grade of C

APPENDIX B

Recommended Course Sequencing

Recommended Course Sequencing

FLORIDA GULF COAST UNIVERSITY

Biology Major

First Year Advising
Recommended Lower Level Track Sheet

Fall	
Courses	Credit Hrs.
❑ ENC 1101 Composition I	3
❑ CHM 1045C General Chemistry I ***See note below**	4
❑ BSC 1010C General Biology I	4
❑ Gen. Ed. Social Science	**3**

Spring	
Courses	Credit Hrs.
❑ ENC 1102 Composition II	3
❑ BSC 1011C General Biology II	4
❑ CHM 1046C General Chemistry II	4
❑ Gen. Ed. Humanities	3

Fall	
Courses	Credit Hrs.
❑ HUM 2510 Understanding Visual and Performing Arts	3
❑ MAC 2311 Calculus I ***See note below***	4
❑ CHM 2210C Organic Chemistry I	4
❑ Gen. Ed. Social Science (GRW)	3
❑ Elective	2

Spring	
Courses	Credit Hrs.
❑ Gen. Ed. Humanities	3
❑ CHM 2211C Organic Chemistry II	4
❑ STA 2023 Statistical Methods	3
❑ Elective	3
❑ Elective	3

- MAC 1105 (College Algebra) is a prerequisite for CHM 1045C (Chemistry I). Students who take MAC 1105 their first semester would need to delay CHM 1045C until their second term and should consult an advisor about continuing the chemistry sequence in Summer term.
- Pre-Professional (dental, medicine, pharmacy, veterinary) students should take Calculus I vs. MAC 2233 (Elementary Calculus) and PHY 2048C and PHY 2049C or PHY 2053C and PHY 2054C.
- Any course substitution for common prerequisites should be discussed with a College Advisor in advance.

See Biology major website: http://www.fgcu.edu/CAS/BiologyBA/index.html
See upper division curriculum: http://www.fgcu.edu/cas/factsheets/BAbiofacts.pdf

Fall	
Courses	Credit Hrs.
❑ PCB 3023C Cell Biology	3
❑ ZOO 3713C Vertebrate Form & Function	3
❑ IDS 3300 Foundations of Civic Engagement	3
❑ IDS 3920 University Colloquium	3
❑ Major Elective	3

Spring	
Courses	Credit Hrs.
❑ PCB 3063C Genetics	3
❑ ISC 3120C Scientific Process	3
❑ Major Elective	3
❑ Elective	3
❑ IDS 3301 Issues in Culture and Society	3

Fall	
Courses	Credit Hrs.
❑ BSC 4910 Sr Project Research	2
❑ BSC 4933 or EVR 4920 or ISC 4930	1
❑ Major Elective	3
❑ Major Elective	3
❑ IDS 3303 Issues in Science and Technology	3
❑ Elective	3

Spring	
Courses	Credit Hrs.
❑ BSC 4911 Sr Project Research Presentation	2
❑ BSC 4933 or EVR 4920 or ISC 4930	1
❑ Major Elective	3
❑ Major Elective	3
❑ IDS 4910 Senior Seminar	3
❑ Elective	3

9 summer credit hours are required

APPENDIX C

Integrative Program Matrix

Integrated Program Matrix

Biology Program
Integrative Program Matrix

University Goals and Student Learning Outcomes	College of Arts and Sciences Core Learning Goals for Interdisciplinary Core	Program Learning Goals and Outcomes	Program Assessment Plans and Criteria	Use of Assessment Results for Continuous Improvement of Program
Aesthetic Sensibility A. Know and understand the variety of aesthetic frameworks B. Analyze and evaluate aesthetic principles at work C. Collaborate in projects involving aesthetic awareness and/or analysis	Aesthetic Sensibility *Interdisciplinary Core Goal* Learners will be able to recognize aesthetic frameworks and to apply that recognition in their analysis of contemporary issues. (IDS 3300, 3301, 3303)	Aesthetic Sensibility Biology students engage in aesthetic frameworks and principles and collaborate in projects involving aesthetic awareness and/or analysis. (IDS 3300, IDS 3301, IDS 3303, PCB 3063C, PCB 3023C, ZOO 3713C)	Program assessment involves the successful completion of the coursework required within the degree program. Examinations, presentations, and projects are assessment tools used in the courses IDS 3300, IDS 3301, IDS 3303, PCB 3063C, PCB 3023C, ZOO 3713C. The criteria for assessment is the success rate of 70% of students mastering course objectives in the core courses. Indirect measurements include SUSSAI evaluations.	As a direct measure of student success in meeting aesthetic sensibility outcomes, percent of students successfully completing these courses will be used. If success rate is these core courses objectives will be used. If success rate is below 70% of mastery, revision of the delivery will take place to better provide students learning opportunities within this criteria. Indirect measurements include the SUSSAI for overall course assessment. If evaluations are negative or less than 2.5 in each area, a review of the course content will be conducted.
Culturally Diverse Perspective A. Know and understand diversity in local/global communities B. Analyze and evaluate the impact of cultural differences C. Participate in projects involving interaction with diverse people, ideas, & values	Culturally Diverse Perspective *Interdisciplinary Core Goal* Learners will be able to recognize cultural differences and to apply that recognition in their analysis of contemporary issues. (IDS 3300, 3301)	Culturally Diverse Perspective Biology students will be able to incorporate the interaction between science and society in their lives. Upon completion of the degree program, students will be able to approach and solve biological problems critically with scientific literacy in individual and group settings and incorporate a diversity of ideas and approaches. (IDS 3301, IDS 3303, PCB 3063C, PCB 3023C, ZOO 3713C)	Program assessment involves the successful completion of the coursework required within the degree program. Examinations, presentations, and projects are assessment tools used in the courses IDS 3301, IDS 3303, PCB 3063C, PCB 3023C, Z00 3713C. The criteria for assessment is the success rate of 70% of students mastering course objectives in the core courses. Indirect measurements include SUSSAI evaluations.	As a direct measure of student success in meeting culturally diverse perspective outcomes, percent of students successfully completing these core courses objectives will be used. If success rate is below 70% of mastery, revision of the delivery will take place to better provide students learning opportunities within this criteria. Indirect measurements include the SUSSAI for overall course assessment. If evaluations are negative or less than 2.5 in each area, a review of the course content will be conducted.

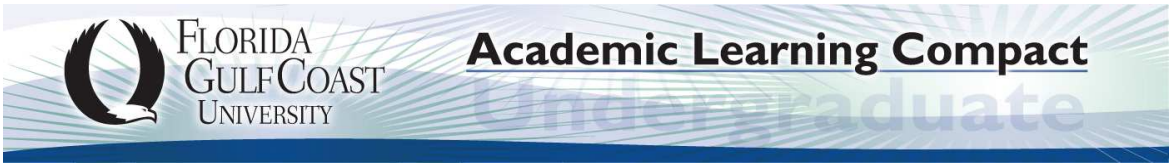
University Goals and Student Learning Outcomes	College of Arts and Sciences Core Learning Goals for Interdisciplinary Core	Program Learning Goals and Outcomes	Program Assessment Plans and Criteria	Use of Assessment Results for Continuous Improvement of Program
Ecological Perspective A. Know issues of ecological/ economic sustainability B. Analyze and evaluate local & global ecological issues C. Participate in ecological/environmental projects	Ecological Perspective *Interdisciplinary Core Goal* Learners will be able to recognize ecological perspectives and to apply that recognition in their analysis of contemporary issues. (IDS 3303)	Ecological Perspective This outcome is covered by student participation in the university required course IDS 3920 Colloquium	The University Quality Enhancement Plan provides an assessment strategy to determine student success in meeting the learning goal of an Ecological Perspective. The criteria for assessment is the success rate of 70% of students passing in each course with a grade of C or better.	Ecological Perspective goal assessment by the QEP will be used to determine student success at FGCU in the development of an ecological perspective; changes derived from this analysis will be used to revise the course in question.
Effective Communication A. Know principles for effective communication B. Organize thoughts and compose ideas C. Participate in collaborative communication projects	Effective Communication *Interdisciplinary Core Goal* Learners will be able to develop, organize, and effectively present an analysis of a contemporary issue in oral, written, and technological forms. (IDS 3300, 3301, 3303, 4910)	Effective Communication Biology students will use knowledge of biological systems from the molecular, cellular, and organismal perspectives in their endeavors. Upon completion of the degree program, students will be able to engage in effective scientific communication in a professional setting, including technical writing, oral presentations and use of available technology. (BSC 4911)	Program assessment involves the successful completion of the coursework required within the degree program. Oral and/or poster presentations of senior research projects are assessment tools used in the course BSC 4911. The criteria for assessment is the success rate of 70% of students mastering course objectives in the core courses. Assessment rubrics for the course are used to evaluate mastery of the course objectives. Indirect measurements include SUSSAI evaluations.	As a direct measure of student success in meeting effective communication outcomes, percent of students successfully completing these core courses objectives will be used. If success rate is below 70% of mastery, revision of the delivery will take place to better provide students learning opportunities within this criteria. Indirect measurements include the SUSSAI for overall course assessment. If evaluations are negative or less than 2.5 in each area, a review of the course content will be conducted.
Ethical Responsibility A. Know and understand ethical issues B. Analyze and evaluate ethical issues in a variety of contexts C. Participate in collaborative projects involving ethical analysis and/or decisions	Ethical Responsibility *Interdisciplinary Core Goal* Learners will be able to recognize ethical positions and to apply that recognition in their analysis of contemporary issues. (IDS 3300, 4910)	Ethical Responsibility Biology students will be able to incorporate the interaction between science and society in their lives. Upon completion of the degree program, students will be able to apply ethical practices and behavior in all aspects of biology scientific endeavors and demonstrate the ethical aspects of science, their conduct as a scientist, and their conduct as a citizen. (BSC 4910)	Program assessment involves the successful completion of the coursework required within the degree program. Successful completion of a senior research project is the assessment tool used in the course BSC 4910. The criteria for assessment is the success rate of 70% of students mastering course objectives in the core courses. Assessment rubrics for the course are used to evaluate mastery of the course objectives. Indirect measurements include SUSSAI evaluations.	As a direct measure of student success in meeting Ethical Responsibility outcomes, percent of students successfully completing these core courses objectives will be used. If success rate is below 70% of mastery, revision of the delivery will take place to better provide students learning opportunities within this criteria. Indirect measurements include the SUSSAI for overall course assessment. If evaluations are negative or less than 2.5 in each area, a review of the course content will be conducted.

University Goals and Student Learning Outcomes	College of Arts and Sciences Core Learning Goals for Interdisciplinary Core	Program Learning Goals and Outcomes	Program Assessment Plans and Criteria	Use of Assessment Results for Continuous Improvement of Program
Information Literacy A. Identify and locate sources of information B. Analyze and evaluate information in a variety of contexts C. Participate in collaborative analysis/application of in formation	Information Literacy *Interdisciplinary Core Goal* Learners will be able to locate, evaluate, and employ information relevant to their analysis of contemporary issues. (IDS 3300, 3301, 3303, 4910)	Information Literacy Biology students will use knowledge of biological systems from the molecular, cellular, and organismal perspectives in their endeavors. Upon completion of the degree program, students will be able to problem solve by the implementation of the scientific process of forming a hypotheses, gathering and critically evaluating information from the literature, the use of technology, employing experimental design in laboratory or field settings, and synthesizing and analyzing information by using numerical and statistical techniques; and comprehend, evaluate, discuss, and use results from the technical literature. (BSC 4910, BSC 4911, ISC 3120C)	Program assessment involves the successful completion of the coursework required within the degree program. Successful completion of a research proposal, senior research project, and research presentation are the assessment tool used in the courses BSC 4910, BSC 4911, ISC 3120C. The criteria for assessment is the success rate of 70% of students mastering course objectives in the core courses. Assessment rubrics for the courses are used to evaluate mastery of the course objectives. Indirect measurements include SUSSAI evaluations.	As a direct measure of student success in meeting Information Literacy outcomes, percent of students successfully completing these core courses objectives will be used. If success rate is below 70% of mastery, revision of the delivery will take place to better provide students learning opportunities within this criteria. Indirect measurements include the SUSSAI for overall course assessment. If evaluations are negative or less than 2.5 in each area, a review of the course content will be conducted.
Problem-Solving Abilities A. Understand multi/interdisciplinary nature of knowledge B. Apply critical, analytical creative and systems thinking C. Work individually and collaboratively to recognize and solve problems	Critical Thinking and Problem-Solving Abilities *Interdisciplinary Core Goal* 1. Learners will be able to apply the perspectives of multiple disciplines to their analysis of contemporary issues. (IDS 4910) 2. Learners will be able to employ critical, creative, and systems thinking in their analysis of contemporary issues. (IDS 3300, 4910) 3. Learners will be able to recognize and solve problems in collaboration with others. (IDS 3300, 4910)	Critical Thinking and Problem-Solving Abilities Biology students will use knowledge of biological systems from the molecular, cellular, and organismal perspectives in their endeavors. Upon completion of the degree program, students will be able to problem solve by the implementation of the scientific process of forming a hypotheses, gathering and critically evaluating information from the literature, the use of technology, employing experimental design in laboratory or field settings, and synthesizing and analyzing information by using numerical and statistical techniques. (BSC 4910, BSC 4911, ISC 3120C)	Program assessment involves the successful completion of the coursework required within the degree program. Successful completion of a research proposal, senior research project, and research presentation are the assessment tool used in the courses BSC 4910, BSC 4911, ISC 3120C. The criteria for assessment is the success rate of 70% of students mastering course objectives in the core courses. Assessment rubrics for the courses are used to evaluate mastery of the course objectives. Indirect measurements include SUSSAI evaluations.	As a direct measure of student success in meeting Critical thinking and Problem-Solving Abilities outcomes, percent of students successfully completing these core courses objectives will be used. If success rate is below 70% of mastery, revision of the delivery will take place to better provide students learning opportunities within this criteria. Indirect measurements include the SUSSAI for overall course assessment. If evaluations are negative or less than 2.5 in each area, a review of the course content will be conducted.

University Goals and Student Learning Outcomes	College of Arts and Sciences Core Learning Goals for Interdisciplinary Core	Program Learning Goals and Outcomes	Program Assessment Plans and Criteria	Use of Assessment Results for Continuous Improvement of Program
Technological Literacy A. Develop knowledge of modern technology B. Process information through use of technology C. Collaborate with others using technology tools	Technological Literacy *Interdisciplinary Core Goal* Learners will be able to recognize the implications of technological choices, and to apply that recognition in their analysis of contemporary issues. (IDS 3303)	Technological Literacy Biology students will use knowledge of biological systems from the molecular, cellular, and organismal perspectives in their endeavors. Upon completion of the degree program, students will be able to problem solve by the implementation of the scientific process of forming a hypotheses, gathering and critically evaluating information from the literature, the use of technology, employing experimental design in laboratory or field settings, and synthesizing and analyzing information by using numerical and statistical techniques. (BSC 4910, BSC 4911, ISC 3120C)	Program assessment involves the successful completion of the coursework required within the degree program. Successful completion of a research proposal, senior research project, and research presentation are the assessment tool used in the courses BSC 4910, BSC 4911, ISC 3120C. The criteria for assessment is the success rate of 70% of students mastering course objectives in the core courses. Assessment rubrics for the courses are used to evaluate mastery of the course objectives. Indirect measurements include SUSSAI evaluations.	As a direct measure of student success in meeting Technological Literacy outcomes, percent of students successfully completing these core courses objectives will be used. If success rate is below 70% of mastery, revision of the delivery will take place to better provide students learning opportunities within this criteria. Indirect measurements include the SUSSAI for overall course assessment. If evaluations are negative or less than 2.5 in each area, a review of the course content will be conducted.
Community Awareness and Involvement A. Know and understand relation ships between individuals and their communities B. Analyze, evaluate and assess human needs and practices C. Participate collaboratively in community service projects	Community Awareness and Involvement *Interdisciplinary Core Goal* Learners will understand the concept of community, recognize the needs and interests that form and disrupt communities, and apply that knowledge in their analysis of contemporary issues. (IDS 3300)	Community Awareness and Involvement Biology students will emerge from their course of study with an educational foundation of biological systems from the molecular, cellular and organismal perspective. (ZOO 3713C, PCB 3023C, PCB 3063C.) All Biology students as a university requirement for graduation must engage in service learning activities.	Program assessment involves the successful completion of the coursework required within the degree program. Examinations, presentations, and projects are assessment tools used in the courses BSC 1010C, BSC 1011C, ZOO 3713C, PCB 3923C, PCB 3063C. The criteria for assessment is the success rate of 70% of students mastering course objectives in the core courses. Successful completion of service learning activities is used for assessment.	As a direct measure of student success in meeting Community awareness and involvement outcomes, percent of students successfully completing these core courses objectives will be used. If success rate is below 70% of mastery, revision of the delivery will take place to better provide students learning opportunities within this criteria. Indirect measurements include the SUSSAI for overall course assessment. If evaluations are negative or less than 2.5 in each area, a review of the course content will be conducted.

APPENDIX D

Academic Learning Compact



Major: Biology
Degree Designation: B.A.
Program Mission Statement:

The Bachelor of Arts Liberal Studies—Biology provides students educational opportunities encompassing molecular, cellular, and organismal areas of study. The degree program produces quality undergraduates who possess a core liberal education coupled with expertise in biology. Graduates are prepared to enter the science community upon graduation in a broad array of careers or continue an education in graduate school and professional programs such as medicine, veterinary science, dentistry, and pharmacy.

Academic Learning Compact

An Academic Learning Compact (ALC) describes expected core student learning outcomes in three areas: content/discipline knowledge and skills, communication skills, and critical thinking skills. This ALC describes (a) expected core learning outcomes for graduates of the FGCU B.A. Biology program and (b) examples of strategies that may be used to assess individual student attainment of expected outcomes.

Core Learning Outcomes
Content/Discipline Knowledge and Skills

Graduates will be able to:

1. Demonstrate knowledge of biological systems from the molecular, cellular, and organismal perspectives.
2. Engage in the scientific process to form hypothesis, synthesize scientific information, gather and analyze data, apply statistical techniques.
3. Engage in effective scientific communication as individuals and as team members by listening, speaking, and writing.
4. Apply ethical practices and behavior in all aspects of biological scientific endeavors.
5. Approach and solve biological problems critically with scientific literacy in individual and group settings.

Communication Skills

Graduates will be able to:

1. Employ the conventions of standard written English.
2. Select a topic, and develop it for a specific audience and purpose, with respect for diverse perspectives.
3. Select, organize, and relate ideas and information with coherence, clarity, and unity.

Critical Thinking Skills

Graduates will be able to:

1. Select and organize information.
2. Identify assumptions and underlying relationships.
3. Synthesize information, and draw reasoned inferences.
4. Formulate an appropriate problem solving strategy.

5. Evaluate the feasibility of the strategy.
6.

Assessment Strategies

Assessment of Content/Discipline Knowledge and Skills

Content/discipline knowledge and skills are assessed at the college and departmental levels through:

6. Exams and problem sets completed in the following required courses: BSC 1010C, BSC 1011C Biology I & II, and PCB 3063C Genetics; PCB 3023C Cell Biology; and ZOO 3713C Vertebrate Form & Function.
7. Written proposal and application of technical aspects of research completed in the following required courses: ISC 3120 Scientific Process and BSC 4910 Senior Research in Biology.
8. Oral and written research presentations completed in the following required courses: BSC 4911 Senior Research Presentation in Biology.
9. Research proposals and laboratory or field techniques completed in the following required courses: ISC 3120 Scientific Process and BSC 4910 Senior Research in Biology.
10. Literature reviews and discussion groups completed in the following required course: BSC 4933 Current Topics in Biology.
11.

Assessment of Communication Skills

Communication skills are assessed as part of the General Education Program through papers, exams, and projects completed in ENC 1101 Composition I, ENC 1102 Composition II, and HUM 2510 Understanding the Visual and Performing Arts. Oral and written communication skills are also assessed in the senior capstone course BSC 4911 Senior Research Presentation in Biology and BSC 4933 Current Topics in Biology.

Assessment of Critical Thinking Skills

Critical thinking skills are assessed as part of the General Education Program through papers, exams, and projects completed ENC 1101 Composition I, ENC 1102 Composition II, and HUM 2510 Understanding the Visual and Performing Arts. Critical thinking skills are also assessed in BSC 4933 Current Topics in Biology, the senior capstone courses BSC 4910 Senior Research in Biology and BSC 4911 Senior Research Presentation in Biology.

Program Assessment Plan and Timeline

The BA Biology assesses the effectiveness of the program for continuous improvement through analysis of content/discipline knowledge and skills, communication skills, and critical thinking skills by problem sets, exams, written and oral scientific communication, student feedback, and multi-rater analysis.

Content/Discipline Knowledge and Skills

Assessment of content/discipline knowledge and skills begins with core courses of BSC 1010C, BSC 1011C Biology I & II, and PCB 3063C Genetics; PCB 3023C Cell Biology; and ZOO 3713C Vertebrate Form & Function that set the foundation of knowledge of biological systems from the molecular, cellular, and organismal perspectives. ISC 3120 Scientific Process provides students the beginning of the scientific process of forming a hypotheses, gathering and critically evaluating information from the literature, using technology, employing experimental design in laboratory or field settings, and synthesizing and analyzing information by using numerical and statistical techniques; and comprehending, evaluating, discussing, and using results from the

technical literature. BSC 4910 Senior Research Project in Biology and BSC 4911 Senior Research Project Presentation in Biology are the culminating senior courses and the capstone of learning experiences for the Bachelor of Arts degree in Biology.

Assessment of the learning outcomes in content/discipline knowledge and skills is by exams and problem sets, written research proposal, completion of research project under mentor guidance, and presentation of research in oral and poster format to a public audience and scrutiny. Program assessment occurs through multi-rater analysis by course faculty and out-side evaluators assessment of students in each of the content areas using an assessment rubric at the end of each course in the semester.

Effective Communication

BSC 4911 Senior Research Project Presentation in Biology is a culminating senior course for this program goal and the capstone of learning experiences for the Bachelor of Arts degree in Biology.

Assessment of meeting the goal of effective scientific communication is by written research proposal including abstract, introduction, hypothesis, methods and materials, results, and conclusions in technical scientific writing. Presentation of the research occurs in oral and poster format to a public audience and with public scrutiny. Program assessment occurs through multi-rater analysis by course faculty and out-side evaluators assessment of students in each of the content areas using an assessment rubric at the end of each course in the semester.

Critical Thinking and Problem-Solving Abilities

Biology students use knowledge of biological systems from the molecular, cellular, and organismal perspectives in their endeavors. Upon completion of the degree program, students problem solve by the implementation of the scientific process of forming a hypotheses, gathering and critically evaluating information from the literature, using technology, employing experimental design in laboratory or field settings, and synthesizing and analyzing information by using numerical and statistical techniques. This is seen in the senior capstone courses of BSC 4910 Senior Project Research in Biology and BSC 4911 Senior Project Research Presentation in Biology. In the research process, students must use critical thinking and problem-solving abilities to work through the following objectives of these courses.

- *Demonstrate the ability to evaluate and to implement the scientific process, its application in different settings and, creative alternative problem solving approaches that are explored within the context of standard scientific conventions.*
- *Design and conduct a research investigation.*
- *Gather and critically evaluate information including library research skills, experimental design in laboratory or field settings, and the use of technology for gathering information.*
- *Synthesize information via the formation of hypotheses, the use of numerical and statistical techniques, the use of simulation models, and the ability to apply a system approach.*
- *Analyze information.*

Further analysis comes from problem sets, exams, and statistical analysis of measurements across semesters. Program assessment occurs through multi-rater analysis by course faculty and

out-side evaluators assessment of students in each of the content areas using an assessment rubric at the end of each course in the semester.

Use of Assessment Findings to Improve Student Learning

Analysis of data is used to promote changes to facilitate consistency in experience for students as well as overall improvement of meeting the learning outcomes. This allows for a highly effective illustration of competence in the level of comprehension and in the demonstration of knowledge of biological systems from the molecular, cellular, and organismal perspectives. Furthermore, mastery of the scientific process to form hypothesis, synthesize scientific information, gather and analyze data, apply statistical techniques is seen. The program assessments provide that students completing the degree have can engage in effective scientific communication as individuals and as team members by listening, speaking, and writing; apply ethical practices and behavior in all aspects of biological scientific endeavors; and can approach and solve biological problems critically with scientific literacy in individual and group settings.

All assessments are completed yearly in the Spring semester. Any curriculum changes necessitated by assessment outcomes are brought before the faculty and sent forward through the Florida Gulf Coast University Curriculum process.

APPENDIX E

2006 Program Assessment and Analysis Reporting Form

PROGRAM ASSESSMENT AND ANALYSIS REPORTING FORM

Name of Program: Bachelor of Arts Biology
Name of Program Leader: Jo Ann Wilson
Date: January 21, 2007

Learning Outcome(s) To Be Measured

University Goals and Student Learning Outcomes	College of Arts and Sciences Core Learning Goals for Interdisciplinary Core	Program Learning Goals and Outcomes
Effective Communication C. Know principles for effective communication D. Organize thoughts and compose ideas C. Participate in collaborative communication projects	Effective Communication *Interdisciplinary Core Goal* Learners will be able to develop, organize, and effectively present an analysis of a contemporary issue in oral, written, and technological forms. (IDS 3300, 3301, 3303, 4910)	Effective Communication Biology students will use knowledge of biological systems from the molecular, cellular, and organismal perspectives in their endeavors. Upon completion of the degree program, students will be able to engage in effective scientific communication in a professional setting, including technical writing, oral presentations and use of available technology. (BSC 4911)
Information Literacy D. Identify and locate sources of information E. Analyze and evaluate information in a variety of contexts F. Participate in collaborative analysis/application of in formation	Information Literacy *Interdisciplinary Core Goal* Learners will be able to locate, evaluate, and employ information relevant to their analysis of contemporary issues. (IDS 3300, 3301, 3303, 4910)	Information Literacy Biology students will use knowledge of biological systems from the molecular, cellular, and organismal perspectives in their endeavors. Upon completion of the degree program, students will be able to problem solve by the implementation of the scientific process of forming a hypotheses, gathering and critically evaluating information from the literature, the use of technology, employing experimental design in laboratory or field settings, and synthesizing and analyzing information by using numerical and statistical techniques; and comprehend, evaluate, discuss, and use results from the technical literature. (BSC 4910, BSC 4911, ISC 3120C)
Problem-Solving Abilities D. Understand multi/interdisciplinary nature of knowledge E. Apply critical, analytical creative and systems thinking F. Work individually and collaboratively to recognize and solve problems	Critical Thinking and Problem-Solving Abilities *Interdisciplinary Core Goal* 4. Learners will be able to apply the perspectives of multiple disciplines to their analysis of contemporary issues. (IDS 4910) 5. Learners will be able to employ critical, creative, and systems thinking in their analysis of contemporary issues. (IDS 3300, 4910) 6. Learners will be able to recognize and solve problems in collaboration with others. (IDS 3300, 4910)	Critical Thinking and Problem-Solving Abilities Biology students will use knowledge of biological systems from the molecular, cellular, and organismal perspectives in their endeavors. Upon completion of the degree program, students will be able to problem solve by the implementation of the scientific process of forming a hypotheses, gathering and critically evaluating information from the literature, the use of technology, employing experimental design in laboratory or field settings, and synthesizing and analyzing information by using numerical and statistical techniques. (BSC 4910, BSC 4911, ISC 3120C)

ASSESSMENT PLAN

Effective Communication

BSC 4911 Senior Research Project Presentation in Biology is a culminating senior course for this program goal and the capstone of learning experiences for the baccalaureate degree in Biology. Assessment of meeting the goal of effective communication is by meeting the course objective as follows.

Effectively communicate in a professional setting, including technical writing, oral presentations and use of available technology.

Assessment of this objective is by written research proposal including abstract, introduction, hypothesis, methods and materials, results, and conclusions in technical scientific writing. Presentation of the research occurs in oral and poster with the scientific writing format to a public audience and with public scrutiny. Course faculty and outside evaluators evaluate students in each of these areas with an assessment rubric (see attached) used at the end of each course during the semester.

Information Literacy

ISC 3120 Scientific Process provides students the beginning of the scientific process of forming a hypotheses, gathering and critically evaluating information from the literature, using technology, employing experimental design in laboratory or field settings, and synthesizing and analyzing information by using numerical and statistical techniques; and comprehending, evaluating, discussing, and using results from the technical literature.

Student assessment is conducted at the end of the Spring semester and the Fall semester when courses are offered.

ISC 3120 Scientific Process is assessed by evaluators of the course final proposal. Evaluator questions including those that encompass information literacy are as follows:

1. How well does the proposal demonstrate the student's ability to access and evaluate library materials (including peer-reviewed journals, monographs, and web-sources)?
2. How well developed was the research's field or laboratory experimental design?
3. How well does the proposal clearly define testable hypotheses?
4. How well does the proposal demonstrate an awareness or use of statistical techniques, simulation models, or a system approach?
5. How well communicated is the proposal?
6. How well does the proposal explore the ethical implications of the proposed research?
7. How well does the proposal relate the work's potential impact or importance to society?
8. Based on the overall quality of the proposal, what is your opinion of the student's capabilities to successfully complete an independent scientific research project?

BSC 4910 Senior Research Project in Biology and BSC 4911 Senior Research Project Presentation in Biology are the culminating senior courses for this program goal and the capstone of learning experiences for the baccalaureate degree in Biology. Assessment of meeting the goal of information literacy is by mastering the course objectives as follows to assess information literacy:

- *Demonstrate the ability to evaluate and to implement the scientific process, its application in different settings and, creative alternative problem solving approaches that are explored within the context of standard scientific conventions.*
- *Design and conduct a research investigation.*
- *Gather and critically evaluate information including library research skills, experimental design in laboratory or field settings, and the use of technology for gathering information.*
- *Synthesize information via the formation of hypotheses, the use of numerical and statistical techniques, the use of simulation models, and the ability to apply a system approach.*
- *Analyze information.*

Assessment of these objectives are by written research proposal, completion of research project under mentor guidance, and presentation of research in oral and poster format to a public audience and scrutiny. Course faculty and outside evaluators evaluate students in each of these areas with an assessment rubric (**see attached**) used at the

end of each course during the semester. In addition faculty mentors provide signature of final research completion as acceptance of mastery of the objectives.

Critical Thinking and Problem-Solving Abilities

ISC 3120 Scientific Process provides students the beginning of the scientific process. Student assessment is conducted at the end of the Spring semester and the Fall semester when courses are offered. ISC 3120 Scientific Process is assessed by evaluators of the course final proposal. Evaluator questions including those that encompass critical thinking and problem-solving abilities are as follows:

1. How well does the proposal demonstrate the student's ability to access and evaluate library materials (including peer-reviewed journals, monographs, and web-sources)?
2. How well developed was the research's field or laboratory experimental design?
3. How well does the proposal clearly define testable hypotheses?
4. How well does the proposal demonstrate an awareness or use of statistical techniques, simulation models, or a system approach?
5. How well communicated is the proposal?
6. How well does the proposal explore the ethical implications of the proposed research?
7. How well does the proposal relate the work's potential impact or importance to society?
8. Based on the overall quality of the proposal, what is your opinion of the student's capabilities to successfully complete an independent scientific research project?

Biology students use knowledge of biological systems from the molecular, cellular, and organismal perspectives in their endeavors. Upon completion of the degree program, students problem solve by the implementation of the scientific process of forming a hypotheses, gathering and critically evaluating information from the literature, using technology, employing experimental design in laboratory or field settings, and synthesizing and analyzing information by using numerical and statistical techniques. This is seen in the senior capstone courses of BSC 4910 Senior Project Research in Biology and BSC 4911 Senior Project Research Presentation in Biology. In the research process, students must use critical thinking and problem-solving abilities to work through the following objectives of these courses.

- *Demonstrate the ability to evaluate and to implement the scientific process, its application in different settings and, creative alternative problem solving approaches that are explored within the context of standard scientific conventions.*
- *Design and conduct a research investigation.*
- *Gather and critically evaluate information including library research skills, experimental design in laboratory or field settings, and the use of technology for gathering information.*
- *Synthesize information via the formation of hypotheses, the use of numerical and statistical techniques, the use of simulation models, and the ability to apply a system approach.*
- *Analyze information.*

Data Analysis

Student assessment was conducted at the end of the Spring 2006 semester and the Fall 2006 semester when courses are offered.

ISC 3120 Scientific Process was assessed by evaluators of the course final proposal using a scale as follows:

5-Excellent 4-Very Good 3-Good 2-Fair 1-Poor N-Not Applicable or No Response

Question	Number of Students	Mean Score
How well does the proposal demonstrate the student's ability to access and evaluate library materials (including peer-reviewed journals, monographs, and web-sources)?	22	3.4
How well developed was the research's field or laboratory experimental design?	22	3.6

How well does the proposal clearly define testable hypotheses?	22	3.6
How well does the proposal demonstrate an awareness or use of statistical techniques, simulation models, or a system approach?	22	2.3
How well communicated is the proposal?	22	3.2
How well does the proposal explore the ethical implications of the proposed research?	22	3.0
How well does the proposal relate the work's potential impact or importance to society?	22	4.3
Based on the overall quality of the proposal, what is your opinion of the student's capabilities to successfully complete an independent scientific research project?	22	3.4

Faculty evaluators using the assessment rubric as follows assessed BSC 4910 Senior Research Project in Biology:

Research Proposal Criteria	*Number of Students*	*Mean Score*
Project provides demonstration of the ability to evaluate and to implement the scientific process, gather and critically evaluate information including library research skills and experimental design, synthesize information via the formation of hypotheses, statistical techniques and analyze the information. Research was completed and acknowledged by the mentor. The research lab notebook was submitted to course faculty on time.	19	95

The 2006 senior research presentations by biotechnology and biology majors were held jointly. All College of Arts and Sciences faculty were invited to participate. At the end of each oral presentation, faculty were able to query students about their research and provide feedback to students and course faculty. Posters were on display for public viewing and comments for both semesters. This allows for objective review of each student and feedback to course faculty for successful accomplishment. BSC 4911 Senior Research Presentation in Biology results are as follows.

Research Poster/Oral Presentation Criteria	*Number of Students*	*Mean Score*
Project provides demonstration of the ability to evaluate and to implement the scientific process, gather and critically evaluate information including library research skills and experimental design, synthesize information via the formation of hypotheses, statistical techniques and analyze the information. All conventions of technical writing are followed in the abstract, introduction with hypothesis/objectives; design, material and methods; results; and conclusions. References cited follow guidelines of the APA, MLA, CBE, or AMA. All material from research sources are referenced with original work. Writing shows attention to the details of performance conventions (spelling, grammar, etc.). Ideas are clearly communicated. Clear, knowledgeable, well-organized, relevant, creative, effective presentation format of the project.	16	89

Use of Assessment Findings to Improve Student Learning

BSC 4910 Senior Research Project in Biology and BSC 4911 Senior Research Project Presentation in Biology were completely reorganized into significant courses with syllabi, course objectives, discussions, working seminars in the Fall 2005. These changes were initiated to facilitate consistency in experience for students during this senior experience. It has been seen that the reorganization of the courses has been highly effective and is demonstrated in the level of research and presentation that has been exhibited.

The results of the evaluation of ISC 3920 Scientific Process revealed that a weakness occurred in the area of *how well the proposal demonstrated an awareness or use of statistical techniques, simulation models, or a system approach*. The course is taken in the junior year of the degree program. The weakness seen in the initial proposal of this course was corrected in the senior courses of BSC 4910 and BSC 4911 when research was developed and statistical analysis was part of the process. Improvement in student scientific writing and approach to statistical analysis will be a part of the improvement plan for coming semesters.

Some students do not finish their research in one semester and take a grade of incomplete. They complete the course the following semester. This is not seen as a weakness, but rather the realization that some research is more labor intensive, delays in receiving reagents, and other unforeseen setbacks can occur in any research endeavor. It is also noted that some students are not comfortable providing the oral presentation to a large group, but excel in a smaller discussion within the context of a poster presentation.

Continued assessment of these capstone courses will be ongoing with an eye on improvement. Information was disseminated at the Department of Biological Sciences meeting January 26, 2007.

APPENDIX F

Equipment And Resources to Support Instructional and Research Requirements

Equipment and resources to support instructional and research requirements

ABO/RH blood cells bio kit
ABO/Rh Blood Eldoncards Kit for 25
ABO/Rh Blood sera set
Anarcharis (Elodea) pk/25
Aquarium cover
Aquarium heater, 100 watt
Aquarium, 135 gal. air pump
Aquarium, 20 gal air pump
Aquarium, 55 gal.
Aquarium, 6" air stone
Aquarium, 65 gal. Hexaquaria
Aquarium, Air pump, battery powered
Aquarium, Undergravel filter, 55 gal., Multipor
Aquarium, Undergravel filter, 55 gal., Pem-play
Audubon Nature Guide, Eastern Forests, Wetland, Atlantic and Gulf Coasts
Audubon Society Field Guides, Set
Autoclave, Sterilmatic Sterilizer, chamber 26Lx16"H, Market Forge # 95-2678
Bacti cinerator II, Lancer
Balances, analytical, +/- 0.1mg, Mettler Toledo A G 104
Balances, electronic, Mettler Toledo B Series College Balance, #B154top loading, Mettler Toledo B Series
Biochemical Pathways chart, Boehringer Mannheim Biochemicals
Biological Displays, Annelid collection, Biosmount prep
Biological Displays, Arthropod collection, Biosmount preparation
Biological Displays, Coelenterate collection, Biosmount
Biological Displays, Echinoderm collection, Biosmount Prep
Biological Displays, Human Brain sections: one coronal, one median sagittal, fully labelled, Biosmount
Biological Displays, Human heart sections, mid-sagittal dissection, labelled, Biosmount
Biological Displays, Human Spinal Cord, 2 sections: whole cord with paired nerves and cross section, labelled
Biological Displays, Mollusk collection, Biosmount preparations
Biological Displays, Platyhelminthes collection, Biosmount Prep
Box, storage autoclavable, orange, 4.75x5,25x6.5, interlocking, Brinkmann
Camera body, Nikon N90S 35 mm
Camera lens, fisheye to fit Nikon N90S
Camera lens, macro to 210 zoom, to fit Nikon N90S
Cameras, underwater, Motor Marine II – Ex
Canoe trailer
Canoe, 18' Grumman aluminum W/ 2 paddles
Carolina Water Bath
Centrifuge, accessory rotors, fixed angle, 12x15mL capacity, IEC #58093
CENTRIFUGES, CLINICAL, 7100 RPM/5125XG, 6X50ml CAPACITY, IEC #428
Chamber, Environmental, Revco, Model #RI-23-555A
Chambers, Environmental, Biotronette Mark III
Color Perception Tests, Ishihara Concise Edition
Cow Eye
Deep well projection slides
Development set
Dialysis Tubing, 1 3/4 in x 100 ft
Digital Electronic Thermometer
Discs, Antibiotic sensitivity, Difco Antibiotic set
Dispenser, variable volume, Plastic, automatic, Nalge
Disposable Mouthpiece pk/100
Disposable Mouthpiece pk/100

Dissecting kit, graduate
Dissecting kit, Micro
DNA Simulation Biokit, class of 30, plastic models
DNA UV Transilluminator/Mini Gel Photography System, Fotodyne #1-1435
DNA White Light Transilluminator, compatible with mini gel photography system, Fotodyne #1-1700
Drying oven, Convection, 4.5 cu ft, electronic, Precision #31625
Earthworms, large, pk/12
Ecology Study Chamber
Ecology Study Chamber, Water Pump
Electromagnetic demonstration app
Environmental Chamber Reference Manual, Biotronette
Exhaust Condenser for Autoclave
Eyepiece Pointer
Finger Printing Science Kit
Flowmeters, Probe, Handheld
Fossil Collection, Advanced
Fossil Collection, General
Fossil Collection, Types
Freezers, Ultralow Temperature, 13.4 cu ft, upright, 29x34x80" exterior, Revco #ULT 1340-3A
Furnace, Muffle, small, 0.14 cu ft
Glassware washer/dryer, Steam Scrubber, undercounter,
Glassware, Washer/Dryer, FlaskScrubbers, undercounter, Labconco #44203
Herbarium case, floor model, steel construction, 26 compartments
Herbarium, Botanial species covers
Herbarium, Mounting paper
Herbarium,Plant press, professional with driers and ventilators
Histology slide set, Marine plants and animals
Human Brain Frontal Section
Ice maker/dispensers, Sanitary, cublet, 40 lbs ice storage, air-cooled, Hoshizaki
Incubator Model 2375T
Incubator, CO2, Fisher Dry-Wall, 10 Cu ft, 36x25.5x39.5", 35-60
Incubator, Lab-Line Model # 302, to replace unavailable model
Incubators, CO2, Air Jacketed, to replace unavailable model
Induction coil
Insect Cabinets, Specimen, Cornell
Insect mounting board
Insect trap, UV replacement light bulb
Insect trap, UV, portable
live culture Amoeba Proteus; live culture
live culture Chlamydomonas, live culture
live culture Euglena gracilis, live culture, cls of 30
live culture Gleocapsa, live culture, cls of 30
live culture Oscillatoria, live culture, cls of 30
live culture Paramecium bursaria; live culture
live culture Peridinium, live culture
live culture Physarum Plasmodium Plate; live culture
live culture Sordaria Fimicola Gray; live culture
live culture Sordaria Fimicola Tan; live culture
live culture Sordaria Fimicola White; live culture
live culture Spirogyra, live culture
live culture Volvox Globator live culture, cls of 30
live culture Vorticella, live culture
Lung function model, bell jar and balloon lungs
Martin Pelvimeter
Metabolism experiment
Microcentrifuges, Micro MB, 14,000 rpm/12,700xG, 12x1.5mL capacity, IEC #3615
Micropipette, adjustable, 100-1000 uL, LabPette digital
Micropipette, adjustable, 20-200 uL, LabPette digital

Micropipette, adjustable, digital, 2-20 uL, LabPette
Microscope, SMZ-1B,twin zoom objective system, total mag. range 4x-231x, interpupillary dist adjust 52-75mm, 4.37:1 zoom ratio, auxilliary objectives available, working dist 32.7-181mm, completely modular system for upgrading, compatible all Nikon access
Microscope Slide boxes to hold 100 slides, plastic
Microscope Slide Cabinet
Microscope slide cabinet, with 80 Carolina blue boxes to hold 25 slides, Neumade
Microscope slides, plain glass, pre cleaned, Corning #2947-3x1, pack of 144
Microscope Slides: Mammal Simple Columnar Epithelium
Microscope Slides: Mammal Simple Cuboidal Epithelium
Microscope Slides: Mammal Simple Squamous Epithelium
Microscope Slides: Mammal Spongy Bone
Microscope Storage Cabinets, mobile, Oak, lockable sliding doors, 24 spaces
Microscope, Field, Swift
Microscope, Nikon Alphaphot 2, binocular, phase contrast applications,
Microscope, NIKON ALPHAPHOT-2 binocular, transmitted light brightfield applications
Microscopes slides, hanging drop, 75X26mm, medium thick, Fisherbrand
Model: Ear, deluxe 8 part, Denoyer-Geppert
Model: Eye in orbit, dissectible into 8 parts, 8x life size, Denoyer-Geppert
Model: Human muscular male and female torso, life-sized
Model: Human muscular male and female, 3/4 life size, interchangeable genitals, dissectible to 45 parts
Model: Knee joint, human, flexible, articulated, Plastic
Model: Larynx and thyroid gland, 2x life size, 7 parts, on base
Model: Leg and pelvis, human, life size, 10 parts, Somso
Model: Liver and gall bladder, human, open dissection, Somso
Model: Pregnant uterus, Human, Life size, 9th month, left and right pelves, Somso
Model: Shoulder joint, human, flexible, articulated, Plastic.
Model: Skin, human section, 70x life size, one piece section, Somso
Models: Arm and shoulder, life size, 6 parts, Somso
Models: Bone Human, Somso
Models: Human 1/2 Head, Life size, on stand, Somso.
Models: Human brain, Direct cast, 9 parts, on base.
Models: Human heart, 1.5x life size, 4 parts, Somso
Models: Human kidney, nephron and glomerulus set, on base, Somso
Models: Skeleton, human articulated, flexible, with stand, Somso. Inculdes dust cover and anatomy manual
Models: Skeleton, human articulated, ligamentous & muscular, Plastic, 1st quality, mounted on quadruped base w casters
Models: Skeleton, human, disarticulated in box, numbered on one side
Models: Skull, disarticulated, human, plastic, first quality, Somso
Models: Skull, human demonstration, 1/2 skull, on stand, but removeable
Models: Skull, human, fetal, plastic, mounted
Models: Spinal cord set, human, on base with transparent cover
Neanderthal Skull, La Chapelle
Ohaus Vernier Caliper
Oscilloscopes, dual channel
Oxygen Meter, Student Analog, Sentry 1, cat.# K3-65-2344
Oxygen Meter, Student Analog, Sentry 1, cat.# K3-65-2344
Percussion hammer
Plant, Klima-gro ecosystem 51"x26"x52"
Portable Dry Spirometers
Power supply dc high voltage
Power supply, 5000 V (cat.# ZS30973-10)
Prepared Slide, Blood Smear
Prepared Slide; Areolar Tissue Verhoeff
Prepared slides, Amoeba proteus, wm
Prepared slides, Bacteria and blood, wm
Prepared slides, bacteria types, Fuschin, wm

Prepared slides, Bacterial Pathogens Slide Set, 12 slides
Prepared slides, Beginner's Fern Life Cycle set, 4 slides:
Prepared slides, Beginner's Monocot Slide set, 6 slides: typical root, root tip, stem, leaf, flower, embryo
Prepared slides, Beginner's Moss Life Cycle Slide set, 4 slides:
Prepared slides, Beginner's Pine Life Cycle set, #3 slides: staminate cone, ovulate cone, embryo
Prepared slides, Beginner's Dicot Slide Set, 5 slides: typical root, stem, leaf, flower, embryo
Prepared slides, Cambium, cs, Young pine stem with nuclei
Prepared slides, Chick Embryology Set, 16 slides
Prepared slides, Commercial Sponge, sec
Prepared slides, Cork sec., cell structure
Prepared slides, Cyanobacteria, Ocillatoria, wm
Prepared slides, Ectotrophic Mycorrhiza, cs
Prepared slides, Flatworm and Roundworm eggs slide set, 13 slides: tropical medicine
Prepared slides, Foraminifera, wm
Prepared slides, General embryology set, vertebrate, 29 slides: chick, pig, starfish, frog
Prepared slides, Gland types set, 6 slides
Prepared slides, Herbaceous and woody dicot stems, cs
Prepared slides, Human Chromosomes-14/21 translocation carrier, spread
Prepared slides, Human Chromosomes-Fragile X Syndrome, spread
Prepared slides, Human Chromosomes-Trisomy 21, spread
Prepared slides, Human Connective Tissues set, 11 slides
Prepared slides, Human Epithelial Tissues set, 9 slides
Prepared slides, Human Heart and Associated Vessels set, 8 slides
Prepared slides, Human Muscle Tissues set, 6 slides
Prepared slides, Human organs and glands of digestion set, 20 slides
Prepared slides, Human Pathology set, 100 slides
Prepared slides, Human sex indicators set, 4 slides: barr bodies, squamous epithelium (m), blood film (m), blood film (f)
Prepared slides, Human Urogenital System Set, 29 slides
Prepared slides, Hydra, ls
Prepared slides, Hydra, wm, ingested food in enteron
Prepared slides, Integument Types set, 8 slides
Prepared slides, Intercalated discs, mammal, cardiac, sec
Prepared slides, Kidney, mammal, sec., injected
Prepared slides, Lichen, wm
Prepared slides, Mallory Preparations set, 10 slides
Prepared slides, Mammalian ovary set, 4 slides: immature ovary, Graffian follicles, corpus luteum, corpus albicans
Prepared slides, Marine diatoms, wm
Prepared slides, Medical Parsitology Slide Set, 65 slides, human parasites
Prepared slides, Mixed blue-green algae, wm
Prepared slides, Mixed gram negative and gram positive bacillus, wm
Prepared slides, Mixed protists, freshwater, wm
Prepared slides, Mold types, wm
Prepared slides, Obelia, wm, hydroid colony w/ reproductive and vegetative polyps
Prepared slides, Onion mitosis, ls
Prepared slides, Paramecium in fission, wm
Prepared slides, Paramecium, wm
Prepared slides, Parenchyma tissues, cs, stem
Prepared slides, Pathogenic Protozoa Slide set, 14 slides
Prepared slides, Penecillium, wm
Prepared Slides, Physalia tentacle(Portuguese man of war), cs
Prepared slides, Pine germinated pollen, wm
Prepared slides, Pine Single Needle Leaf, cs
Prepared slides, Planaria combination, wm, plain and injected
Prepared slides, Plasmodesmata, ls
Prepared slides, Plasmodium malariae, smear
Prepared slides, Rhizopus conjugation, wm

Prepared slides, Schlerenchyma tissue, cs, leaf or stem
Prepared slides, Schlerids, sec
Prepared slides, Silver preparations set, 5 slides
Prepared slides, Stentor, wm
Prepared slides, Tapeworm Proglottids comparison, wm: Taenia and Diplidium
Prepared slides, Trichinella spiralis male and female, wm
Prepared slides, Verhoff Preparations set, 6 slides
Prepared slides, Volvox, wm
Prepared slides, White oak wood, CRT, 3 section wood slides
Quebec colony counter, Leica, Darkfield
Raingauge Kit, Electronic
Reaction timer, battery operated, response time in 0.01s increments
Reflection telescope, 6" (Meade)
Refrigerator, General Purpose Lab, CFC-free, 36 5/8 x 31 x 83 3/4 in exterior, Revco Model # REL2304A12
Refrigerator/Freezer, Explosion-Proof, 30 x 34 x 79 in exterior, Fisher Isotemp
Replacement Filter Cartridge
Replacement Filter Cartridge
Shaking Water Bath, Shallow Form, Temp Range +5-99.9C, Precision
Sheep Heart
Shell Collection, Deluxe Mollusk
Shell Collection, Gastropod
Single Concavity Slides
Skeleton, Armadillo, articulated
Skeleton, Bat, articulated
Skeleton, Cat, articulated
Skeleton, Cat, disarticulated
Skeleton, Perch, articulated
Skeleton, Pigeon, articulated
Skull, A. aferensis Cranium grade 2
Skull, A. africanus (Dart) Cranium, Grade 2
Skull, A. africanus (Robinson) (Taung) skull Grade 2
Skull, A.africanus , Grade 2 Sterkfontein
Skull, Adult Female Chimpanzee Skull
Skull, Adult male Chimpanzee skull
Skull, Amia (Blowfin
Skull, Cranium, Africanus, w/ Dentition
Skull, Cranium, Boisei, w/ Dentition, male
Skulls, Cranium, Erectus, w/ Dentition, Grade 1
Skull, Cranium, Habilis, w/ Dentition
Skull, Cro Magnon Skull
Skull, H erectus Skull, Java
Skull, H.erectus Skull, Sinanthropus (peking Man)
Skull, human, fetal, plastic, mounted
Skull, Male Howler Skull
Skull, Male Rhesus Skull
Skull, Male Tree Shrew
Skull, Young Chimpanzee Skull
Skulls, Set Gorilla Male & Female Skull
Slim Guide Skinfold Caliper
Sodium Benzoate Taste Paper
Soil pH and Moisture Tester
Soil Salinity Tester
Soil Salinity Tester
Soil Sieve, Sand-Mud
Soil Sieve, Sand-Mud
Soil Thermometer
Soil Thermometer

Solar Spectrum Chart
Sound level meter, 3 ranges, battery operated
Spectrophotomer, flourometer, filter, digital, 340-750nm range Turner model 450
Spectrophotometers, Mini-20
Spectrophotometers, Spectronic 21 model DUV, wavelength range 200-1000nm and 340-1000nm, Milto Roy #33-22-79
Spectrum Analysis Chart
Sphygmomanometer, students, one hand aneroid, 10 year calibration warranty, vinyl zipper case
Sphygmomanometers: blood pressure system
Spirometer, portable, dry: accurate hand-held, measures vital capcaity, tidal volume, and expiratory reserve volume
Staining jar, verticle, clear, heavy glass, grooved for 3x1" slides; lid
Stereoscope, aerial photography F-71
Stethoscope, Sprague-Rapport style, clinical, pouch, 2 pairs of ear tips
Stethoscopes, one-piece aparatus; lightweight; anatomically shaped ear tips; fiberglass diaphragm
Super Jumbo Pipette, pk/10
Super Jumbo Pipette, pk/10
Surveying, Distance Measurers, Haglof Forestor DME 201, Type 2
Surveying, Transit, Survey Sokkia, Ushikata Model Tracon S-25
Thermal Cycler, Robocyler, Stratagene, 40 Temperature Cycler
Tuning forks set
Two-point discrimination, perception sensory device
Underwater camera, Nikonos
Urinary Glucose Test Strip
Vials, flint glass, screw cap, 9.5 dram
Vision BioKit, Human, Carolina for 30 students
Vortex mixer, Maxi Mix Plus, Thermolyne #M63215
Wearever Alum Dissecting Pan
Wet Spirometer, Phipps & Bird
White Rats

APPENDIX G

Department of Biological Sciences Faculty Service and Scholarship Activities

Department of Biological Sciences
Service and Scholarship Activities
May 1, 2005 – April 30, 2006

SERVICE ACTIVITIES

University

Cruz-Alvarez, Marilyn. Faculty Senator.
Cruz-Alvarez, Marilyn. University Research Safety Committee.
Demers, Nora. 2004-present Graduate Affairs Committee Member
Demers, Nora. 2005-present Library Team Committee Member
Demers, Nora. 2002-present Research Safety Committee Member
Goebel, Anna. 2005-present. IACUC (Institutional Animal Care and Use Committee).
Goebel, Anna. 2005-present. Faculty Senate.
Goebel, Anna. Summer 2005. Search committee for Wetlands Ecologist position through telephone interviews.
Jackson, Bette. 2001-present. Institutional Affairs Team.
Jackson, Bette. 2002-present. Faculty Senate.
Jackson, Bette. 2001-present. General Education Council.
Jackson, Bette. 2004-present. Graduate Affairs Committee Member
Michael, Scott. 2005-present. Research Safety Committee Member
Renk, Cliff. 2002-present. IACUC (Institutional Animal Care and Use Committee).
Renk, Cliff. 2000-present. Institutional Review Board chair.
Renk, Cliff. Honors Program director.
Renk, Cliff. Faculty advisor for the Pre-Professional Student Organization and PIKE.
Rosenthal, M. 2005 – present, Chair, Female Faculty committee at FGCU
Rosenthal, M. 2005 – present, Faculty advisor to the Gay/Straight Alliance
Rosenthal, M. 2004 – present, Provost task force on teaching excellence
Rosenthal, M. 2004 – present, Faculty advisor to the University Hillel club
Rosenthal, M. 1997- present, Student Affairs Team, FGCU. Chair: 1997 – 1998, 1998 - 1999, 2002-2003.
Rosenthal, M. 1997 – present, Student of the Year Award committee. Chair 1998, 1999, 2003
Rosenthal, M. 1999 - present, Member, Student Code of Conduct Committee
Rosenthal, M. 2002- present, Member, Faculty senate
Ueda, Tak. 2005-06. faculty senate.
Ueda Tak. Research Safety Committee Member.
Wilson, JA. Florida Gulf Coast University, Search Committee, Collegiate High School Academic Coordinator. 2005.

College

Cruz-Alvarez, Marilyn. Department of Environmental and Marine Science Search Committee.
Cruz-Alvarez, Marilyn. CAS Undergraduate Curriculum Committee.
Cruz-Alvarez, Marilyn. CAS Student Affairs Committee
Cruz-Alvarez, Marilyn. Office Coordinator of Student Programs. Whitaker Center.
Demers, Nora. 2005-2006 Ephemeral College Governance Team
Demers, Nora. 2000-present Interdisciplinary Studies Curriculum Committee
Demers, Nora. 2004-present Whitaker Center Leadership Team Member
Goebel, Anna. 2006-present. CAS Governance Team.
Isern, Sharon. 2005. Florida Gulf Coast University, Whitaker Center Research Task Force.
Isern, Sharon. Florida Gulf Coast University Whitaker Center Faculty. 2005-present
Jackson, Bette. 2005. Florida Gulf Coast University, Whitaker Center Research Task Force.
Jackson, Bette. 2004-present. Florida Gulf Coast University Whitaker Center Faculty.
Jackson, Bette. 2005. Search committee for laboratory manager.
Michael, Scott. 2006. Search committee for sociology professor.
Renk, Cliff. 2005-present. Whitaker Center Faculty, Leadership Team, and Evaluation Office Coordinator.

Rosenthal, M 2001 – present, Member, Collegium Committee, FGCU
Rosenthal, M 1999 – present, Member, Grade Appeals Committee, College of Arts and Sciences
Ueda, Tak. 2006. Search committee. Physics.
Ueda, Tak. 2005-06. Peer Review committee.
Ueda, Tak. Faculty advisor for the Molecular Biotechnology club.
Ueda, Tak. Whitaker Center Faculty. 2004-present.
Wilson, JA. College of Arts and Sciences, Whitaker Center Leadership Team, 2005-2006.
Wilson, JA. College of Arts and Sciences, ex-officio member Whitaker Center Advisory Board. 2005.
Wilson, JA. College of Arts and Sciences, Chair, Whitaker Center Research Task Force. 2005.
Wilson, JA. College of Arts and Sciences Whitaker Center Faculty. 2005-present.
Wilson, JA. College of Arts and Sciences, Reorganization Task Force. 2005.
Wilson, JA. College of Arts and Sciences Leadership Team. 2005-06.

Program

Cruz-Alvarez, Marilyn. Department of Biological Sciences Search Committee. Four positions.
Goebel, Anna. Department of Biological Sciences Search Committee. Four positions.
Isern, Sharon. Biotechnology Postdoctoral Scholar Search Committee.
Michael, Scott. Biotechnology Postdoctoral Scholar Search Committee.
Renk, Cliff. Department of Biological Sciences Search Committee. Four positions.
Renk, Cliff. BS Biology Proposal Committee member.
Rosenthal, Martha. BS Biology Proposal Committee member.
Shapiro, Allan. Biotechnology Postdoctoral Scholar Search Committee, Chair.
Ueda, Tak. Department of Biological Sciences Search Committee. Four positions.

Local Community

Cruz-Alvarez, Marilyn. Edison Regional Science Fair judge.
Demers, Nora. 2003-present Representative to the Estero Bay Agency on Bay Management for the RGMC
Demers, Nora. 2002-present Secretary and member for the RGMC (Responsible Growth Management Coalition)
Isern, Sharon. 2006. Greater Naples AAUW. *Girls + Math + Science = Success;* presentation.
Goebel, A. Judge. Edison Regional Science Fair. Spring 2006.
Jackson, Bette. Judge. Edison Regional Science Fair. Spring 2006.
Jackson, Bette. Collier County Audubon Society Education Committee.
Jackson, Bette. Corkscrew Swamp Sanctuary bird-banding workshop participant.
Michael, Scott. Representative for Lee, Charlotte, and Collier Counties Economic Development Committees to the Florida Life Sciences Road Map Meeting.
Renk, Cliff. Science Review Committee for the Edison Regional Science Fair member.
Ueda, Tak. Edison Regional Science Fair grand judge
Wilson, JA. Chair. Science Review Committee for the Edison Regional Science Fair.
Wilson, JA. Greater Naples AAUW. *Girls + Math + Science = Success;* presentation, *How to help prepare your daughter for college.* Naples, FL, February 11, 2006.

Profession

Cruz-Alvarez, Marilyn. NSF Grant for Research Instrumentation panelist.
Demers, Nora. 2005-2006 Grant Reviewer, National Fish and Wildlife Foundation
Demers, Nora. 2002-present Manuscript reviewer: *Journal of College Science Teaching*
Jackson, Bette. 2005. Nominating Committee of the Wilson Ornithological Society.
Jackson, Bette. Reviewer/referee. *Florida Field Naturalist* and the *Wildlife Society Bulletin.*
Michael, Scott. Reviewer. *American Journal of Tropical Medicine and Hygiene, Biotechniques, Journal of Neurobiology, Applied Herpetology.*
Michael, Scott. Foreign Collaborator/advisor for the US State Department project with the Tajik Science and Research Institute of Preventive Medicine of the Ministry of Health, Tajikistan and the Republican Center for Quarantine and Extremely Dangerous Infections, Kyrgyz Republic.
Rosenthal, M. 2004 – present, Member, Society for the Scientific Study of Sexuality
Shapiro, Allan. NSF Competitive Grants Review Panel, Food and Aquaculture SBIR/STTR. March 2006.
Shapiro, Allan. NSF Competitive Grants Review Panel, Agricultural Biotechnology SBIR/STTR. March 2006.
Ueda, Tak. Reviewer. NSF and USDA research rant proposals.

Wilson JA. American Board of Bioanalysis, Certification Examination Committee and reviewer/writer. 2005-present.
Wilson JA. American Society for Clinical Laboratory Scientists. Editor/reviewer. On-line continuing education. 2005- present.
Wilson JA. American Society for Clinical Laboratory Scientists, Student Awards Committee. 2000-present.
Wilson JA. Expert Consultant/Witness: State of Florida Department of Health Prosecution Services Unit 4052 Bald Cypress Way, Tallahassee, FL 32308 2000-present.
Wilson JA. National Certification Agency for Medical Laboratory Personnel Examination Committee. 1990-present.

SCHOLARLY ACTIVITIES

Awards and Honors

Renk, Cliff. 2006. American Society for Microbiology *Scholars in Residence.*
Rosenthal, M. 2005-2006 Awarded a sabbatical leave for Spring 2006
Wilson, JA. American Society of Clinical Pathology Editor's Choice Award, Clinical Immunology, *Incorporating West Nile Virus Testing into the Clinical Laboratory.* June, 2005.

Patents

Isern, Sharon. Provisional patent*. Method for delivering materials into biological systems using sonic energy.*

Publications—Books

Helen A. Cadwallader and **Martha S. Rosenthal** , Discoveries in Human Systems. Hunter Publishing Company, North Carolina. 2003, 2006.

Publications—Peer Reviewed Journal Articles and Contributions to Collections

Isern, Sharon. *Viral transgenesis of embryonic cell cultures from the freshwater microcrustacean Daphnia.* Journal of Experimental Zoology 305A:62-67 (2006).
Buckley, CR. **Michael**, SF, Irschick, DJ. *Early hatching decreases jumping performance in a direct-developing frog, Eleutherodactylus coqui.* Functional Ecology 19:67-72. 2005*.*
Hrobowshi UM, Garry RF, **Michael** SF. *Peptide inhibitors of Dengue virus and West Nile virus infectivity.* Virology Journal 2:49. 2005.
Shapiro, Allan. *Nitric oxide signaling in plants*. Vitamins and Hormones 72:339-398.
Wilson JA, Basler C. *Etiology of Aseptic Meningitis Critical to Patient Care.* ASCP Tech Sample, American Society for Clinical Pathology. No. CI-5 2006.
Wilson JA, Hammerling JA. *Meeting JCAHO Standards in the Prevention of Medical Errors.* On-line continuing education publication for the American Society for Clinical Laboratory Science. http;//www.ascls.org. Summer 2005.

Publications—Book Reviews

Wilson, JA. F.A. Davis, Co. Publishers, invited review of text chapters, *Molecular Diagnostics.* January, June, December, 2005; January, 2006.
Wilson, JA. John Wiley, Co. Publishers, invited review of proposal and chapter, *Essentials of Genetics*, December 2005.

Scholarly Presentations—Refereed

Cruz-Alvarez, Marilyn. *Is the CCE1 gene involved in the proliferation and/or developmental arrest of apical meristems in cauliflower?* Iowa State University Plant Sciences Institute Symposium on Plant Meristems, June 2-5, 2005.
Isern, Sharon. *Viral transgenesis of embryonic cell cultures from the freshwater microcrustacean Daphnia.*
Daphnia Genomics Consortium Meeting. Indiana University. Bloomington, IN. January 19, 2006.
Wiersma JA**, Isern**, Sharon. *Novel method for gene expression in Hydra*. Biophysical society Annual Meeting. Salt Lake City. February 18-22, 2006.

Blair AD, Costin JM, **Isern**, S, Alberte RS, **Michael** SF. *Small molecule anti-adhesion inhibitor of viral entry*. American Society of Tropical Medicine and Hygiene 54th Annual Meeting. Washington DC. December 11-15, 2005.
Ellis BR, Munene E, **Isern, S**, Otsyula MG, **Michael SF**. *Modified ELISA and endpoint microneutralization assay for the rapid screening and differential diagnosis of Dengue, West Nile and Yellow Fever antibodies in East African non-human primate hosts.* American Society of Tropical Medicine and Hygiene 54th Annual Meeting. Washington DC. December 11-15, 2005
Shapiro, Allan. *Systems biology explanations of cell-to-cell communication coordinating the Arabidopsis hypersensitive response.* 12th International congress on Molecular Plant-Microbe Interactions Merida, Mexico. December 14-19, 2005.
Ueda, Tak. *Manipulation of seed specific antioxidant enzyme to enhance plants' tolerance to abiotic stress.* Habitation 2006 Conference Orlando, FL February 2006.
Ueda, Tak. *Exploring desiccation tolerance as means to facilitate plant transport and cultivation in space..* Habitation 2006 Conference Orlando, FL February 2006.
Wilson, JA. 73thASCLS/AACC Annual Meeting and Clinical Laboratory Exposition. Poster presentation, *Misidentification of calcium monohydrate crystals in ethylene glycol poisoning.* Orlando, FL. July 26-July 30, 2005.
Wilson JA**, Renk** CR. American Society for Microbiology 105th General Meeting, poster presentation, *Comparison of age and gender differences in the prevalence of oral pathogens in subjects with periodontitis*. Atlanta, June 5-9, 2005.

Publications—Opinion Pieces

Michael, SF. A "Chick-a-dee" or a "Co-qui"? Letter to the Editor. Science *310:620-621.*

Grants/Appropriations

Cruz-Alvarez, Marilyn. USDA AREA Seed Grant: "*Preliminary studies on a putative novel transmembrane receptor from Brassica oleracea"*
Cruz-Alvarez, Marilyn. NSF MRI Grant: "*Acquisition of instrumentation for an undergraduate research program in biotechnology".*
Cruz-Alvarez, Marilyn. FGCU. ORSP: "*A new look at Melaleuca: a genetic approach to an environmental problem.*
Goebel, Anna. FGCU. ORSP: *Genetic variation in the Boreal Toad: Is Bufo boreas in Colorado a new species?*
Isern, Sharon, Michael, Scott. Co-PI, Department of Defense appropriation. *Dual Use Technologies for Biodefense.* 10% effort each.
Jackson, Bette. *Studies of the Black Spiny-tailed Iguana: an invasive species on Gasparilla Island, Florida.* Co-PI.
Michael, Scott. *Small molecule chemistries*. Cerno Biosciences.
Ueda, Tak. NSF MRI Grant: "*Acquisition of instrumentation for an undergraduate research program in biotechnology".*
Ueda, Tak. FSGC *Undergraduate Space Research Program*.

TEACHING

Awards and Honors

Jackson, Bette. Who's Who Among America's Teachers. 2005

APPENDIX H

New BA Biology Curriculum

Biology (BA)

Degree: Bachelor of Arts
Major: Biology
Department: Biological Science
Semester Hours Required for Degree: 120

The College of Arts & Sciences offers a Bachelor of Arts in Biology. The field of biology encompasses living systems across several levels from molecular to ecological. In the Biology major, students will have the opportunity to explore the biological sciences across these levels. Students will gain an understanding of interactions between organisms and their environments (including biomedical and evolutionary perspectives). Pedagogically, emphasis is on lab-centered, hands-on learning.

This degree program integrates a biological science disciplinary course of study with an issues-based interdisciplinary core. The science core curriculum provides groundwork in the chemical, mathematical, and physical sciences, as well as a broad foundation in the biological sciences that prepares students for entry-level science positions, graduate study in the biological sciences, and professional degrees such as optometry, veterinary medicine, denistry, pharmacy, and medicine.

Students completing the Bachelor of Arts Biology degree may also elect to complete a minor in education to satisfy professional education requirements for Florida Teacher Certification for secondary biology education.

Common Prerequisites

BSC1010C	General Biology w/lab I (4)
	Acceptable substitutes: PCB X101, X011, X021, X131, BSC X040, 2012
BSC1011C	General Biology w/lab II (4)
	Acceptable substitutes: ZOO X010C, BOT X010C, BSC X041C, BOT X013C
CHM1045C	General Chemistry I w/lab (4)
CHM1046C	General Chemistry II w/lab (4)
CHM2210C	Organic Chemistry I w/lab (4)
	Acceptable substitutes: PHY X043/X043L, X048/X048L, X049/X049L or equivalent
CHM2211C	Organic Chemistry II w/lab (4)
	Acceptable substitutes: PHY X053/X053L, X048/X048L, X049/X049L, or equivalent
MAC2311	Calculus I (4)
	Acceptable substitutes: MAC 2233, 2253, X281
MAC2312	Calculus II (4)
	Acceptable substitutes: STA 2122, 2014, 2023, 2024, 2321 or equivalent, MAC 2234, 2254, 3282

NOTE: All combined lecture and laboratory courses (marked with C) are equivalent to taking the lecture and laboratory separately as two courses.

Coursework in the Major (12)

ISC 3120	Scientific Process (3)
PCB 3023C	Cell Biology (3)
PCB 3063C	Genetics (3)

Plus one of the following (3)

PCB 3043C	General Ecology (3)
PCB 3673	Evolutionary Biology (3)
ZOO 3713C	Vertebrate Form and Function (3)

Electives: 24 hours from the following

Molecular Biology

BCH 3023C	Biochemistry (3)
BCH 3025C	Analytical Biochemistry (3)
BOT 4394C	Plant Molecular Biology (3)
BSC 4422C	Methods in Biotechnology (3)
PCB 3253C	Developmental Biology (3)
PCB 4522C	Molecular Genetics (3) or PCB 4xxx Molecular Biology (3)
PCB 4783C	Cell Membrane Physiology (3)

Cellular Biology, Physiology

BOT 4503C	Plant Physiology (3)
MCB 3020C	General Microbiology (4)
MCB 3723C	Environmental Microbiology (3)
MCB 4503	Virology (3)

MCB 4203C Pathogenic Microbiology (3)
MCB 4507C Virology, Mycology, Parasitology (3)
PCB 3703C Human Physiology (3)
PCB 3723C Comparative Animal Physiology (3)
PCB 4233C Immunology (3)
ZOO 4753C Histology (3)
ZOO 4743 Neuroscience (3)

Organismal Biology, Ecology, Evolution
BSC 3030 Biology & Society (2)
BSC 3xxxC Invertebrate Zoology
BSC 3403C Environmental Quant Techniques (3)
OCB 4043C Marine Ecology (3)
PCB 3043C* General Ecology (3)
PCB 3414C Behavioral Ecology (3)
PCB 3460C Ecosystem Monitoring and Research Methods (3)
PCB 4303C Limnology and Wetlands (3)
PCB 4673* Evolutionary Biology (3)
PCB 4674C Reptile-Amphibian Evolution (4)
ZOO 3713C* Vertebrate Form & Function (3)
ZOO 4436C Evolution of the Mammals (3)
ZOO 4454C Icthyology (3)
ZOO 4472C Ornithology (3)
ZOO 4485C Mammalogy (3)

*If this course was taken to satisfy a core requirement, it cannot be counted as an elective.

Other Electives
BSC 4900 Dir Ind Study/Research Biology (1-3)
BSC 4910 Sr Project Research in Biology (2)
BSC 4911 Sr Project Presentation in Biology (2)
BSC 4912 Senior Seminar in Biology (3)
BSC 4930 Special Topics in Biology (2-4)
BSC 4933 Current Topics (1)
BSC 4940 Internship in Biology (2-4)
CHM 2210C* Organic Chemistry I w/lab (4)
CHM 2211C* Organic Chemistry with Lab II (4)*
EVR 4605C Environmental Toxicology (3)
EVR 4920 Current Topics (1)
HIS 3470 History of Science and Technology (3)
ISC 4930 Current Topics (1)
MAC 2312* Calculus II (4)
OCE 3008C Oceanography (3)
PHY 2048C* General Physics with Lab I (4); Acceptable substitutes: PHY 2053C
PHY 2049C* General Physics with Lab II (4); Acceptable substitutes: PHY 2054C

*If this course was taken to satisfy common prerequisites, it cannot be counted as an elective.

Collegium of Integrated Learning
Complete the following (12 hours):
IDS 3300 Foundations of Civic Engagement (3)
IDS 3301 Issues in Culture and Society (3)
IDS 3303 Issues in Science and Technology (3)
IDS 4910 Integrated Core Senior Seminar (3)

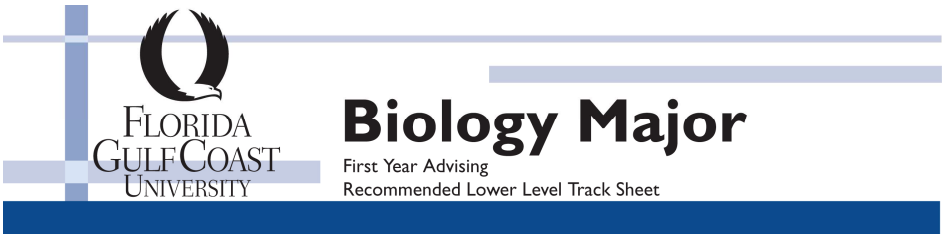
Additional Requirements
IDS 3920 University Colloquium (3)

Additional electives may be required to reach a minimum of 120 credit hours for the baccalaureate degree. At least 48 of the 120 hours must be upper division (courses numbered 3000 and above).

Academic Advising

An academic advisor will assist students in preparing an academic plan that incorporates university, college, and program requirements including general education, foreign language, Gordon Rule writing and computation, and Eagles Connect-Service Learning.

Recommended Course Sequencing



Fall	
Courses	Credit Hrs.
❑ ENC 1101 Composition I	3
❑ CHM 1045C General Chemistry I ***See note below**	4
❑ BSC 1010C General Biology I	4
❑ Gen. Ed. Social Science	**3**

Spring	
Courses	Credit Hrs.
❑ ENC 1102 Composition II	3
❑ BSC 1011C General Biology II	4
❑ CHM 1046C General Chemistry II	4
❑ Gen. Ed. Humanities	3

Fall	
Courses	Credit Hrs.
❑ HUM 2510 Understanding Visual and Performing Arts	3
❑ MAC 2311 Calculus I ***See note below**	4
❑ CHM 2210C Organic Chemistry I	4
❑ Gen. Ed. Social Science (GRW)	3
❑ Elective	2

Spring	
Courses	Credit Hrs.
❑ Gen. Ed. Humanities	3
❑ CHM 2211C Organic Chemistry II	4
❑ STA 2023 Statistical Methods	3
❑ Elective	3
❑ Elective	3

- ❖ MAC 1105 (College Algebra) is a prerequisite for CHM 1045C (Chemistry I). Students who take MAC 1105 their first semester would need to delay CHM 1045C until their second term and should consult an advisor about continuing the chemistry sequence in Summer term.
- ❖ Pre-Professional (dental, medicine, pharmacy, veterinary) students should take Calculus I vs. MAC 2233 (Elementary Calculus) and PHY 2048C and PHY 2049C or PHY 2053C and PHY 2054C.
- ❖ Any course substitution for common prerequisites should be discussed with a College Advisor in advance.

See Biology major website: http://www.fgcu.edu/CAS/BiologyBA/index.html
See upper division curriculum: http://www.fgcu.edu/cas/factsheets/BAbiofacts.pdf

College of Arts & Sciences Undergraduate

Fall	
Courses	Credit Hrs.
❑ PCB 3023C Cell Biology	3
❑ ZOO 3713C or PCB 3673 or PCB 3043C	3
❑ IDS 3300 Foundations of Civic Engagement	3
❑ IDS 3920 University Colloquium	3
❑ Major Elective	3

Spring	
Courses	Credit Hrs.
❑ PCB 3063C Genetics	3
❑ ISC 3120C Scientific Process	3
❑ Major Elective	3
❑ Elective	3
❑ IDS 3301 Issues in Culture and Society	3

Fall	
Courses	Credit Hrs.
❑ Major Elective	3
❑ Major Elective	3
❑ Major Elective	3
❑ IDS 3303 Issues in Science and Technology	3
❑ Elective	3

Spring	
Courses	Credit Hrs.
❑ Major Elective	3
❑ Major Elective	3
❑ Major Elective	3
❑ IDS 4910 Senior Seminar	3
❑ Elective	3

9 summer credit hours are required