

Cecil College Academic Program Review



Physics and Physical
Sciences Programs

June 2013

Cecil College
Physics and Physical Sciences Programs
Academic Programs Review

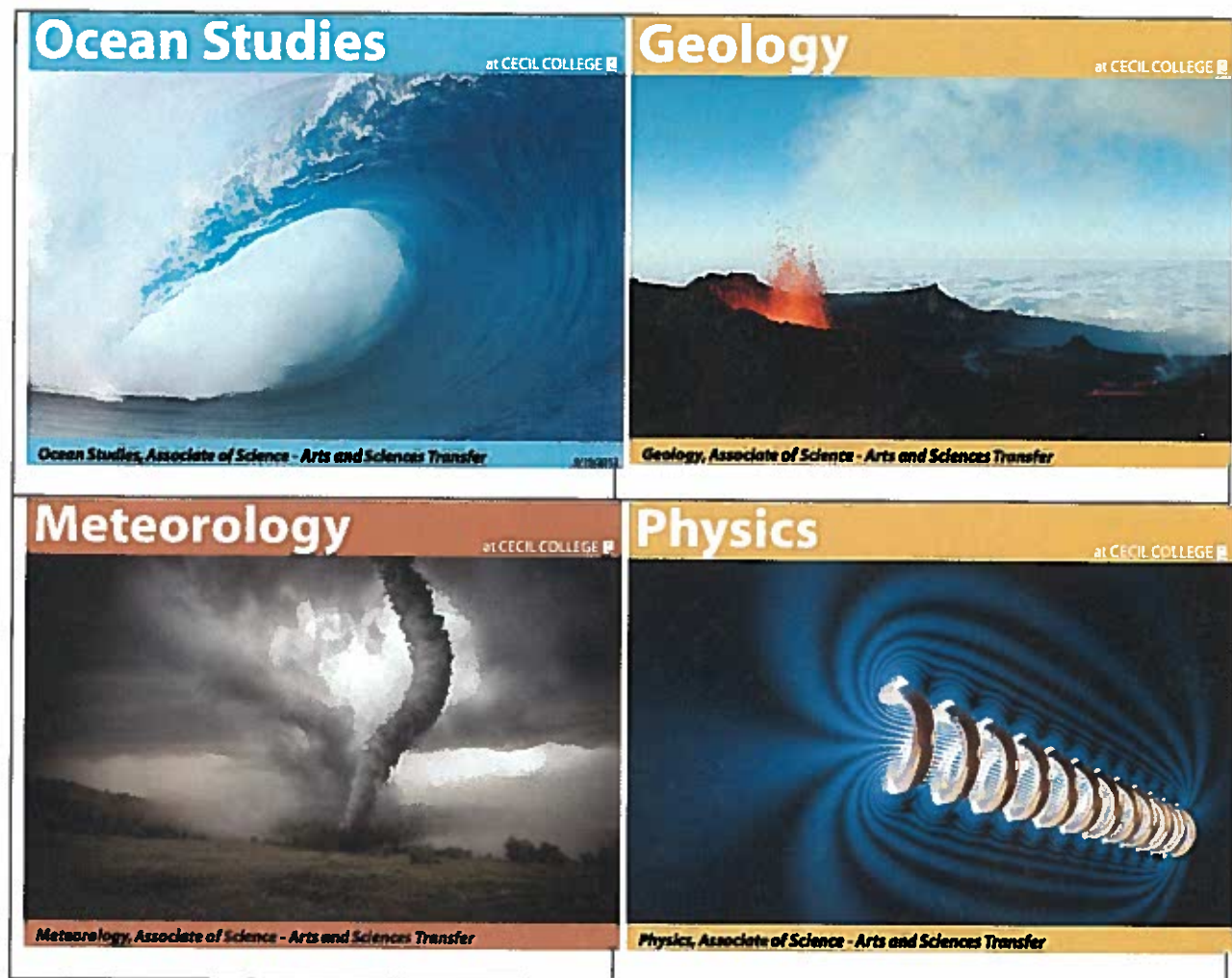


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Executive Summary

The physics program of Cecil College plays an important role as a major in its own right and as a provider of required core courses for other science majors and science courses for the non-major. The majors supported in the past were biology, chemistry, mathematics, and technology related degrees (CAD, electronics). Today these courses also support the new engineering majors, computer science, cyber-security, a revised CAD program, as well as the physical science major options of geology, meteorology, and ocean studies.

Physics is a foundational science required by other majors because it establishes the credibility of science and the scientific methods. The early successes of physics revealed the natural world to be predictable, understandable, and measureable. This perspective of the natural world has become the basis for engineering and the sciences. The contemporary world, with all its amazing technology, is possible because of our modern understanding of the physical laws that govern the universe.

The physics program and its related physical science programs support the mission of the college as well as the initiatives outlined in the Strategic Plan by offering a variety of courses that develop the technical, observational, and experimental skills of students to assure their success in an increasingly sophisticated 21st century.

Students of the physics and physical sciences courses at Cecil enjoy a high quality of instruction. The regular and adjunct faculty who are teaching these courses bring strong credentials and diverse backgrounds into creating an active learning environment. The good completion rates of these courses can be attributed to the dedication of the faculty as well as the small class sizes and administrative support for the student's hands-on experience with the latest technology.

Since 2005 through 2012 the overall physical science enrollment has increased 61% while physics has increased by 68%. In that time period the number of physics majors has tripled while the majors for the physical sciences have increased by 38%. With the exception of meteorology, the college is above the national average with female majors and average with minorities. Recruitment of students for all majors is an ongoing process, as well as increasing completion rates of the two-year degrees.

The current technology and facilities are adequate for the existing student population thanks to the excellent support from the IT department and the administration. Expansion into the new Engineering-

Physics-Math building offers exciting opportunities. The machine shop in the new building will require a new full-time position to manage the shop and teach classes, while the projected enrollment increases in physics, engineering and physical science will likely necessitate another full-time position within the next two years. In the interim, release time should be given to a faculty member for lab support of the present 2 labs and future support of the 3 new labs.

1.0 Programs Descriptions

The Physics degree program prepares students to transfer to a four-year institution for continuing study in physics. A physicist's work ranges from basic research into the subatomic realm to the dynamics of galaxies as well as the practical development of devices and instruments. Students with a bachelor's degree in physics may continue their education or enter into industry. The program gives the student a choice of three engineering electives as 60% of physicists employed in industry work in engineering.

The Meteorology degree program prepares students to transfer to a four-year institution for continuing study in meteorology. Meteorologists work at deciphering and predicting the behavior of weather, climate change, and improving models for weather prediction.

The Geology degree program prepares students to transfer to a four-year institution for continuing study in geology. Geologists apply techniques from many different scientific disciplines in search of new sources of energy-producing materials, additional reserves of mineral resources, and hidden quantities of ground water.

The Oceans program prepares students to transfer to a four-year institution for continuing study in ocean sciences and coastal studies. Ocean scientists use their knowledge and skills to answer questions about the ocean system and the atmosphere.

Our physics and physical science courses serve various populations:

- 1) Courses for non-science majors such as business education and the liberal arts
- 2) Algebra based transfer courses for students in biology, medical fields, and other professional programs.
- 3) Calculus based transfer courses for engineering, computer science, physical sciences, biological sciences, and other programs with such requirements.
- 4) Service courses for vocational and technical programs.

Physics and most physical sciences are experimental sciences: laboratory experiences should be a very important part of the undergraduate curriculum. Two-year physics programs have historically been involved in the improvement of introductory physics curriculum because of the focus on student learning at two-year colleges. Experiential learning currently is at the forefront of physics education research. At Cecil College, it is a very important part of all the

physics and physical science offerings. Students are better prepared to understand the relationships between theory and experimental evidence when it is supported by their own personal experience.

1.1 Programs History

- The physics program has come a long way in the past 15 years. Previously, the program was inadequate for two-year transfer as it included neither calculus Physics I, II, and III, nor the required math classes beyond one year of calculus. Today it is built as a strong program that enables physics degree graduates to transfer as entering juniors to their four-year institution.
- In addition, during the last decade, three physical science transfer degree programs have been added (Ocean Studies, Meteorology, and Geology) along with engineering two-year transfer programs, an engineering software certificate program, and a revitalized CAD two-year degree program. The additions of these science and engineering programs have strengthened the College's offerings at a time when STEM programs have come to national prominence.
- Enrollment in physics classes has benefitted from the introduction of the physical science and engineering degrees, and increases in biology and premed majors.
- All physics and physical science programs were recently articulated as two-year transfer programs with Millersville University.
- Offering more diverse selections of physical science courses has increased liberal arts students and community enrollment.

Cecil College Mission Statement

"Cecil College is a comprehensive, open-admission, learner-centered institution. The College provides career, transfer, and continuing education coursework and programs that anticipate and meet the dynamic intellectual, cultural, and economic development challenges of Cecil County and the surrounding region. Through support services and a technologically enriched learning environment, the College strives to empower each learner with skills, knowledge, and values needed for college preparation, transfer to four-year institutions, workforce entry or advancement, and personal enrichment. Further, Cecil College promotes an appreciation of cultural diversity, social responsibility, and academic excellence."

CC Strategic Plan 2010-15

Cecil College Strategic Plan

The Strategic Plan focuses on four strategic initiatives:

1. Emphasis on student completion.
2. Increasing opportunities for Bachelors and Higher Degree Programs in Cecil County.

3. Creating workforce opportunities related to federal government expansion.
4. Becoming a regional leader in incorporating innovative technology for learning.

Cecil College's physics and physical science programs support the mission of the College as well as the initiatives outlined in the Strategic Plan by offering a variety of courses developing quantitative, technical, observational, and experimental skills which are essential for the continued study or employment in, as well as the enriched understanding of, numerous scientific and technical fields. These programs provide hands-on access to leading technology and experimental methodology that prepares and enriches students of all fields for success in an increasingly sophisticated 21st century.

1.2 Faculty Profiles

Below is a brief listing of credentials, courses taught, committee participation, [past and present] other College activities, and other professional endeavors.

Name	Degrees	Courses Taught	College Activities
Full Time			Affiliations
Anand Patel	BS, MS	PSC 105, PHE 200, 201, 211, 212, 213, PHE 221	Senate, Academic Affairs, Search Committees, Outreaches, ASE
Gail Wyant	BS, MS	PHY103, 181, 182, 207, 208, 209, PSC 105, 120, 135, 140, 150, 220 PHE 185, PHE 201, 211, 225, 285	Senate, Academic Affairs, Faculty Affairs, IT, grants Honor Society Advisor, Search Committees, Outreaches, AAPT,AGU,AMS,ASE
Part Time			
Patrick Carney	BS, MA, MS	PSC 105	ACS
Emily Hauser	BS, MA, MS	PSC 140	Marine scientist
Karl Kalbacher	BS, MS	PSC 120, PSC 135	Registered geologist
Kristen Magas	BS, MS	PSC 125, PHE 200, 201, 211, 213	Search Committees, grants Lego League
John Schab	BA, BS, MS	PHY 103	ITEA, AFCEA, NMTC
Robert Stoflet	BS	PSC 105, 125	Meteorologist, math tutor
Kirk Tackitt	BS, MS, PhD	PHE 225 (Lab), 285 (Lab)	LabView Associate
Pat Wyant	BS, MA, MS, PhD	PHY 207, 208, 209, PSC 105, PSC 125, 140, 220, PHE 212, 285, CSC	Outreach Support

		106, CSC 109, CSC 205	APS, AAPT, ACM, AGU, AMS
Patrick Wyant	BS, MA	PHY 103, PSC105, PSC 140, CSC 106	IT support

The strong and diverse backgrounds of Cecil's full and adjunct faculty bode well for all programs.

1.3 Program Curriculum

- The programs are listed in the following pages along with the required courses, electives, and a suggested sequence for students to complete the majors.

Geology

Arts and Sciences Transfer — Physical Science Option – Geology

Award: Associate of Science

Degree Code: ASGE

Number of Credits: 65

Program Description: This program option prepares students to transfer to a four-year institution for continued study in geology. Geologists apply techniques from many different scientific disciplines in search of new sources of energy-producing materials, additional reserves of mineral resources, and hidden quantities of ground water.

The computer literacy requirement will be met throughout the course work in the degree program.

Transfer Information: Cecil College has articulation agreements with Maryland and regional institutions. Contact your advisor for detailed information.

Required Courses:

Number	Title	Credits
General Education Requirements		
ACT	Activity Electives	2
ARTS/HUM	Arts and Humanities Electives ¹ [H]	3
CHM 103 and	General Chemistry I [S]	3
CHM 113	General Chemistry I Lab	1
CHM 104 and	General Chemistry II [S]	3
CHM 114	General Chemistry II Lab	1
PHY 207	General Physics I with Lab [SL]	5
EGL 101	Freshman Composition [E]	3
EGL 102	Composition and Literature [H]	3
MAT 127	Introduction to Statistics [M]	4
SOC SCI	Social Science Electives ² [SS]	6

Program Requirements

GEN ED	General Education Electives	3
MAT 201	Calculus I with Analytic Geometry [M]	4
MAT 202	Calculus II with Analytic Geometry [M]	4
PHY 208	General Physics II with Lab [SL]	5
PSC 120	Physical Geology [SL]	4
PSC 135	Introduction to Climate Science with Lab [SL]	4
PSC 140 or	Introduction to Ocean Studies with Lab [SL]	
ENV 106 and	Introduction to Environmental Science [S]	3
ENV 116	Environmental Science Lab	1
SPH 121 or	Interpersonal Communications [H]	3
SPH 141	Public Speaking [H]	

¹Selection may not include EGL designation.

²Courses must be from two different disciplines.

Recommended Sequence: The following is a recommended sequence of courses for completing this program as a full-time student. Developmental and prerequisite course requirements, credit load, and/or course availability may affect a student's individual progress. Students should consult their degree audit at MyCecil or an academic advisor for individual degree planning.

Fall I	(17 credits)
CHM 103 and	General Chemistry I
CHM 113	General Chemistry I Lab
PSC 135	Introduction to Climate Studies with Lab
EGL 101	Freshman Composition
SOC SCI	Social Science Elective
MAT 127	Introduction to Statistics
SPH 121 or	Interpersonal Communications
SPH 141	Public Speaking

Spring I	(16 – 17 credits)
MAT 201	Calculus I with Analytic Geometry
CHM 104 and	General Chemistry II
CHM 114	General Chemistry II Lab
PSC 140 or	Introduction to Ocean Studies with Lab
ENV 106 and	Introduction to Environmental Science
ENV 116	Introduction to Environmental Science Lab
EGL 102	Composition and Literature
ACT	Activity Elective(s)

Fall II	(15 – 16 credits)
MAT 202	Calculus II with Analytic Geometry
PHY 207	General Physics I with Lab
SOC SCI	Social Science Elective
GEN ED	General Education Elective

Spring II	(17 – 18 credits)
MAT 127	Introduction to Statistics
PHY 208	General Physics II with Lab
PSC 120	Physical Geology
ART/HUM	Arts and Humanities Elective
ACT	Activity Elective(s)

Career Opportunities: mining industry, oil and natural gas industry, mapping sub-surfaces, water resource management, geographer, environmentalist, hydrographer, metallurgist, seismologist.

Meteorology

Arts and Sciences Transfer — Physical Science Option – Meteorology

Award: Associate of Science

Degree Code: ASMT

Number of Credits: 65

Program Description: This program option prepares students to transfer to a four-year institution for continued study in meteorology. Meteorologists work at deciphering and predicting the behavior of weather, climate change and improving models of weather prediction. The computer literacy requirement will be met throughout the course work in the degree program.

Transfer Information: Cecil College has articulation agreements with Maryland and regional institutions. Contact your advisor for detailed information.

Required Courses:

Number	Title	Credits
General Education and Program Requirements		
ACT	Activity Electives	2
ARTS/HUM	Arts and Humanities Elective ¹ [H]	3
CHM 103 and	General Chemistry I [S]	3
CHM 113	General Chemistry I Lab	1
EGL 101	Freshman Composition [E]	3
EGL 102	Composition and Literature [H]	3
GEN ED	General Education Elective	3
MAT 127	Introduction to Statistics [M]	4
MAT 201	Calculus I with Analytic Geometry [M]	4
MAT 202	Calculus II with Analytic Geometry [M]	4
MAT 203	Multivariable Calculus [M]	4
MAT 246	Introduction to Differential Equations [M]	3
PHY 207	General Physics I with Lab [SL]	5
PHY 208	General Physics II with Lab [SL]	5
PSC 135	Introduction to Climate Science with Lab [SL]	4
PSC 140	Introduction to Ocean Studies with Lab [SL]	4
PSC 220	Meteorology [SL]	4
SOC SCI	Social Science Electives ² [SS]	6

¹Selection may not include an EGL designation.

²Courses must be from two different disciplines.

Recommended Sequence: The following is a recommended sequence of courses for completing this program as a full-time student. Developmental and prerequisite course requirements, credit load, and/or course availability may affect a student's individual progress. Students should consult their degree audit at MyCecil or an academic advisor for individual degree planning.

Fall I	(15 credits)
CHM 103 and	General Chemistry I
CHM 113	General Chemistry I Lab
MAT 201	Calculus I with Analytic Geometry
PSC 140	Introduction to Ocean Studies with Lab
EGL 101	Freshman Composition

Spring I	(15 – 16 credits)
MAT 127	Introduction to Statistics
MAT 202	Calculus II with Analytic Geometry
GEN ED	General Education Elective
EGL 102	Composition and Literature
PSC 135	Introduction to Climate Science with Lab

Fall II	(15 credits)
MAT 203	Multivariable Calculus
PHY 207	General Physics I with Lab
ART/HUM	Arts and Humanities Elective
SOC SCI	Social Science Elective
ACT	Activity Elective(s)

Spring II	(16 – 17 credits)
MAT 246	Introduction to Differential Equations
PHY 208	General Physics II with Lab
PSC 220	Meteorology
SOC SCI	Social Science Elective
ACT	Activity Elective(s)

Career Opportunities: government agencies, military, education, broadcasting, consulting, NOAA, NASA, atmospheric research.

Ocean Studies

Arts and Sciences Transfer — Physical Science Option – Ocean Studies

Award: Associate of Science
Degree Code: ASOS
Number of Credits: 64–66

Program Description: This program option prepares students to transfer to a four-year institution for continued study in ocean sciences and coastal studies. Ocean scientists use their knowledge and skills to answer questions about the ocean system and the atmosphere.

The computer literacy requirement will be met throughout the course work in the degree program.

Transfer Information: Cecil College has articulation agreements with Maryland and regional institutions. Contact your advisor for detailed information.

Required Courses:

Number	Title	Credits
General Education Requirements		
ACT	Activity Electives	2
ARTS/HUM	Arts and Humanities Electives* [H]	3
BIO 130 and	Principles of Biology I [S]	3
BIO 131	Principles of Biology I Lab	1
CHM 103 and	General Chemistry I [S]	3
CHM 113	General Chemistry I Lab	1
PHY 181 or	Introductory College Physics I with Lab [SL]	4–5
PHY 207	General Physics I with Lab [SL]	
EGL 101	Freshman Composition [E]	3
EGL 102	Composition and Literature [H]	3
MAT 127	Statistics [M]	4
SOC SCI	Social Science Electives* [SS]	6

Program Requirements

BIO 132 and	Principles of Biology II	3
BIO 133	Principles of Biology II Lab [S]	1
CHM 104 and	General Chemistry I [S]	3
CHM 114	General Chemistry I Lab	1
MAT 201	Calculus I with Analytical Geometry [M]	4
PHY 182 or	Introductory College Physics II with Lab [SL]	4–5
PHY 208	General Physics II with Lab [SL]	
PSC 135	Introduction to Climate Science with Lab [SL]	4
PSC 140	Introduction to Ocean Studies with Lab [SL]	4
PSC 220	Meteorology [SL]	4
SPH 121 or	Interpersonal Communications [H]	3
SPH141	Public Speaking [H]	

*Selection may not include EGL designation.

*Courses must be from two different disciplines.

Recommended Sequence: The following is a recommended sequence of courses for completing this program as a full-time student. Developmental and prerequisite course requirements, credit load, and/or course availability may affect a student's individual progress. Students should consult their degree audit at MyCecil or an academic advisor for individual degree planning.

Fall I (15 credits)

CHM 103 and	General Chemistry I
CHM 113	General Chemistry I Lab
BIO 130 and	Principles of Biology I
BIO 131	Principles of Biology I Lab
PSC 135	Introduction to Climate Science with Lab
EGL 101	Freshman Composition

Spring I (15 credits)

MAT 201	Calculus I with Analytic Geometry
CHM 104 and	General Chemistry II
CHM 114	General Chemistry II Lab
BIO 132 and	Principles of Biology II
BIO 133	Principles of Biology II Lab
EGL 102	Composition and Literature
GEN ED	General Education Elective

Fall II (18 – 19 credits)

PHY 181 or	Introductory College Physics I with Lab
PHY 207	General Physics I with Lab
PSC 140	Introduction to Ocean Studies with Lab
SOC SCI	Social Science Elective
ART/HUM	Arts and Humanities Elective
ACT	Activity Elective (s)
SPH 121 or	Interpersonal Communications
SPH 141	Public Speaking

Spring II (16 – 17 credits)

MAT 127	Introduction to Statistics
PHY 182 or	Introductory College Physics II with Lab
PHY 208	General Physics II with Lab
PSC 220	Meteorology
SOC SCI	Social Science Elective
ACT	Activity Elective(s)

Career Opportunities: geological, physical, chemical or biological oceanographer, marine biologist, fisheries scientist, marine archaeologist, marine policy expert.

Physics

Arts and Sciences Transfer — Physics Option

Award: Associate of Science
Degree Code: ASPS
Number of Credits: 65-66

Program Description: This program option prepares students to transfer to a four-year institution for continued study in physics. A physicist's work ranges from basic research into the subatomic realm to the dynamics of galaxies as well as the practical development of devices and instruments. Students with a bachelor's degree in physics may continue their education or enter industry.

The computer literacy requirement will be met throughout the course work in the degree program.

Transfer Information: Cecil College has articulation agreements with Maryland and regional institutions. Contact your advisor for detailed information.

Required Courses:

Number	Title	Credits
General Education and Program Requirements		
ACT	Activity Electives	2
ARTS/HUM	Arts and Humanities Electives ¹ [H]	3
CHM 103 and	General Chemistry I [S]	3
CHM 113	General Chemistry I Lab	1
CHM 104 and	General Chemistry II [S]	3
CHM 114	General Chemistry II Lab	1
EGL 101	Freshman Composition [E]	3
EGL 102	Composition and Literature [H]	3
GEN ED	General Education Elective	3
MAT 201	Calculus I with Analytic Geometry [M]	4
MAT 202	Calculus II with Analytic Geometry [M]	4
MAT 203	Multivariable Calculus [M]	4
MAT 240	Introduction to Linear Algebra [M]	4
MAT 246	Introduction to Differential Equations [M]	3
PHE 221 or	Thermodynamics	3-4
PHE 225 or	Digital Electronics and Instrumentation	
PHE 285	Principles of Electric Circuits	4
PHY 207	General Physics I with Lab [SL]	5
PHY 208	General Physics II with Lab [SL]	5
PHY 209	General Physics III with Lab	5
SOC SCI	Social Science Electives ² [SS]	6

¹Selection may not include EGL designation.

²Courses must be from two different disciplines.

Recommended Sequence: The following is a recommended sequence of courses for completing this program as a full-time student. Developmental and prerequisite course requirements, credit load, and/or course availability may affect a student's individual progress. Students should consult their degree audit at MyCecil or an academic advisor for individual degree planning.

Fall I (16 credits)

CHM 103 and	General Chemistry I
CHM 113	General Chemistry I Lab
MAT 201	Calculus I with Analytic Geometry
PHY 207	General Physics I with Lab
EGL 101	Freshman Composition

Spring I (17 – 18 credits)

CHM 104 and	General Chemistry II
CHM 114	General Chemistry II Lab
MAT 202	Calculus II with Analytic Geometry
PHY 208	General Physics II with Lab
EGL 102	Composition and Literature
ACT	Activity Elective(s)

Summer I (3 – 5 credits)

PHY 209	General Physics III with Lab
PHE 221	Thermodynamics*

Fall II (12 – 16 credits)

MAT 246	Introduction to Differential Equations
PHE 225	Digital Electronics and Instrumentation*
GEN ED	General Education Elective
ARTS/HUM	Arts and Humanities Elective
SOC SCI	Social Science Elective

Spring II (13 – 17 credits)

MAT 203	Multivariable Calculus
MAT 240	Introduction to Linear Algebra
PHE 285	Principles of Electronic Circuits*
SOC SCI	Social Science Elective
ACT	Activity Elective (s)

Summer II (3 – 5 credits)

PHY 209	General Physics III with Lab
PHE 221	Thermodynamics*

*Students must choose one course from PHE221, 225 or 285.

Career Opportunities: astronomer, computer programmer, physicist, teaching, research and development, engineering.

2.0 Statistical Data

The statistical data that was asked for and included in this report for majors (See appendices A-D for complete data) is not very meaningful because there is not enough data to generate significance. The required items are listed in the appendix while completion rates are listed below with graphical representation. A more telling statistical story is the increase in numbers and diversity of students taking physics and physical science classes over the past five years.

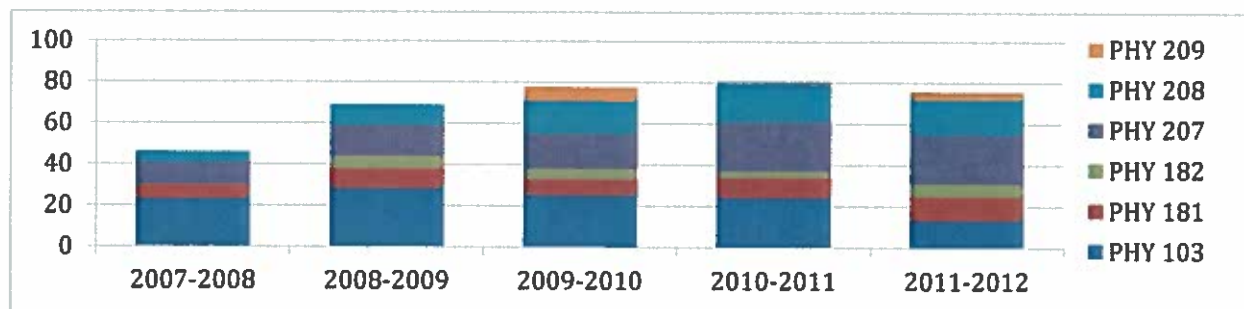
The completion rates for Physics courses are provided below. Completion is defined as a grade of C or better for the course.

	Fiscal Year 2007-2008			Fiscal Year 2008-2009			Fiscal Year 2009-2010			Fiscal Year 2010-2011			Fiscal Year 2011-2012		
	SU07	FA07	SP08	SU08	FA08	SP09	SU09	FA09	SP10	SU10	FA10	SP11	SU11	FA11	SP12
PHY 103	25%	75%	50%		85%	100%	89%	45%	47%		79%	87%		89%	83%
PHY 181	100%	67%		100%	100%			80%			91%			80%	
PHY 182				100%		100%			100%			100%			100%
PHY 207	100%	90%			85%	100%		68%			60%			71%	
PHY 208			83%			100%		100%	100%			90%			94%
PHY 209							100%				100%		100%		

The completion counts for Physics courses are provided below. Completion is defined as a grade of C or better for the course.

	Fiscal Year 2007-2008			Fiscal Year 2008-2009			Fiscal Year 2009-2010			Fiscal Year 2010-2011			Fiscal Year 2011-2012		
	SU07	FA07	SP08	SU08	FA08	SP09	SU09	FA09	SP10	SU10	FA10	SP11	SU11	FA11	SP12
PHY 103		12	7		17	11	8	10	7		11	13		8	5
PHY 181		4		3	7			8			10			12	
PHY 182				2		4			5			3			6
PHY 207		9			11	4		17			24			24	
PHY 208			5			10		4	12			18			17
PHY 209							7				2		4		
Totals		25	12	5	35	29	15	39	24		47	34	4	44	28

Below is a graph showing the enrollment variation with time for each physics course offered over the past 5 years. For the physics courses there is an increasing trend from 2007-2011 with a small drop in 2012. The engineering and science majors increase parallels the physics increase.



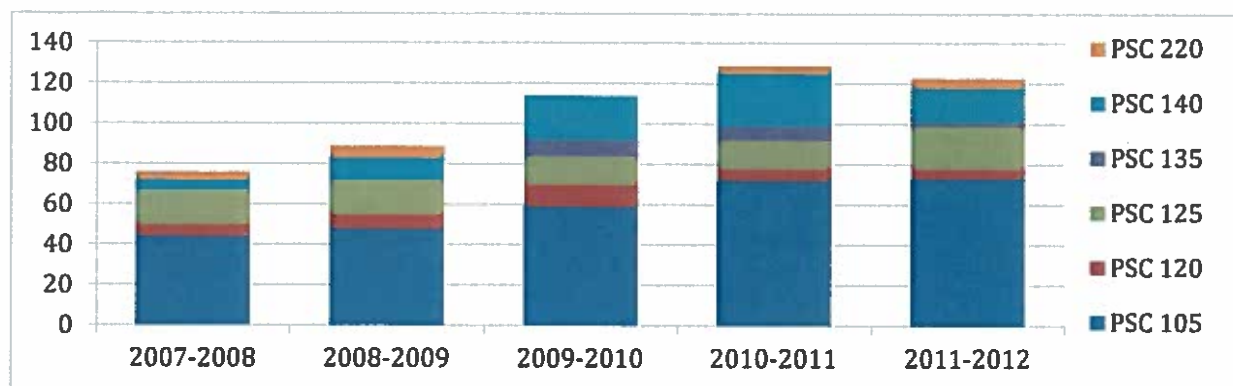
The completion rates for Physical Science courses are provided below. Completion is defined as a grade of C or better for the course.

	Fiscal Year 2007-2008			Fiscal Year 2008-2009			Fiscal Year 2009-2010			Fiscal Year 2010-2011			Fiscal Year 2011-2012		
	SU07	FA07	SP08	SU08	FA08	SP09	SU09	FA09	SP10	SU10	FA10	SP11	SU11	FA11	SP12
PSC105	33%	83%	69%	55%	77%	67%	82%	81%	69%	100%	80%	63%	100%	77%	85%
PSC120			100%			78%			92%			86%			71%
PSC125	67%	36%	63%	100%	73%	36%		75%	53%		54%	70%		82%	80%
PSC135									73%		64%		100%	100%	
PSC140		83%			55%	100%		75%	58%	83%	81%	62%	67%	55%	70%
PSC220			80%			86%						50%			63%

The completion counts for Physical Science courses are provided below. Completion is defined as a grade of C or better for the course.

	Fiscal Year 2007-2008			Fiscal Year 2008-2009			Fiscal Year 2009-2010			Fiscal Year 2010-2011			Fiscal Year 2011-2012		
	SU07	FA07	SP08	SU08	FA08	SP09	SU09	FA09	SP10	SU10	FA10	SP11	SU11	FA11	SP12
PSC105		20	20	6	24	18	9	26	24	12	35	25	7	33	33
PSC120			6			7			11			6			5
PSC125		4	10	4	8	5		6	8		7	7		9	12
PSC135									8		7		1	1	
PSC140		5			6	5		15	7	5	13	8	4	6	7
PSC220			4			6						4			5
Total		29	40	10	38	41	9	47	58	17	62	50	12	49	62

Below is a graph showing the enrollment variation with time for each physical science course offered over the past 5 years.



Note again that like physics, there is an increasing trend from 2007-2011 for the physical science classes, with a small drop in 2012. The biggest increase is in PSC 105 which is required for teachers and a general education science elective.

2.1 General Data Trends from Statistical Data

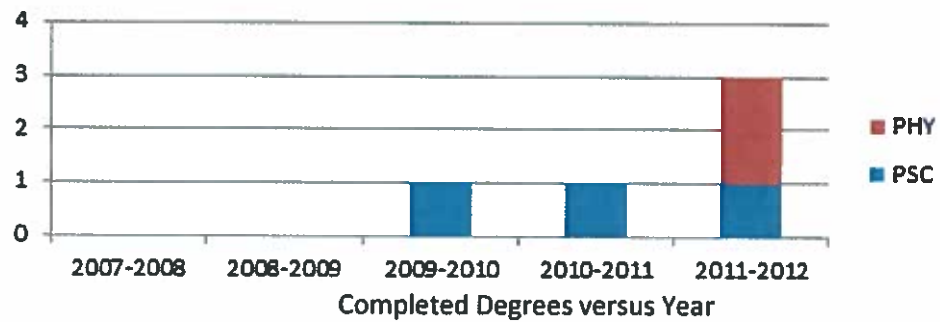
Physics Courses	5 Year Average Completion	Physical Science	5 Year Average Completion
PHY 103	71 %	PSC 105	75 %
PHY 181	88 %	PSC120	85 %
PHY 182	100 %	PSC 125	66 %
PHY 207	82 %	PSC 135	84%
PHY 208	100%	PSC 140	72 %
PHY 209	100%	PSC 150	Not taught yet
		PSC 220	70%

The preceding table shows that the completion rates for most physics and physical science courses are above 70% on average. Small classes and labs (capped at 16), dedicated faculty who devote time to helping students, tutoring in the math lab, and active learning approaches used in the classroom contributed to these rates.

Major	Started Majors in Past Five Years	% Female	% Male	Finished Degrees in Five years
Physics	28	43%	57%	2
Geology	5	60%	40%	1
Meteorology	9	0%	100%	2
Oceans	13	54%	46%	0

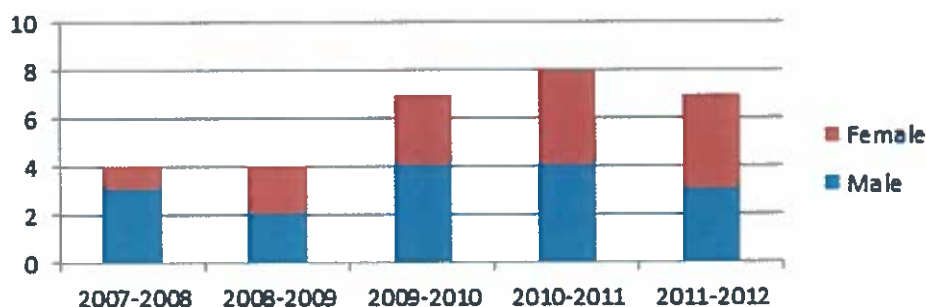
In the five year period from 2007 to 2012, twenty-eight students started their studies as physics majors but only two stayed to finish the degree. Twenty-seven students started as physical science majors with three finishing. The data shows most students come to Cecil with the intention of transferring to a four-year institution as soon as possible. The faculty and advisors have actively encouraged students over the past three years to stay and complete their degrees. The following graph

does not have many data points, but it suggests a possible trend of an increase in degree completion for physics and the physical sciences. This past spring the college graduated one Physics major and one Ocean Studies major.



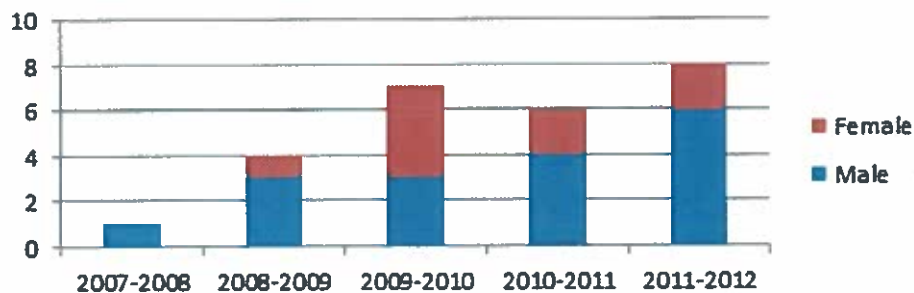
Another trend worth pointing out from the previous tables and the graphs below is the increase in the number of women showing interest in physics and the physical sciences majors. The national average for undergraduate and graduate physics majors reported by the American Institute of physics is close to 20%. Cecil College's female physics majors' weighted average percentage for the past 5 years is 43%.

Freshman Physics Majors versus Year



The American Geoscience Institute in 2012 reported that the undergraduate and graduate female majors for geology was near 40% compared to Cecil's 60%, while for the atmospheric sciences it was near 30 %. At the undergraduate level, Ocean Studies is a new major with not much data to report but at the graduate level it is close to 55 %. Our small class sizes and enthusiastic faculty that support students' interests, growth and success in their majors have contributed to these numbers.

Freshman Physical Science Majors versus Year



The age demographics show that for physics majors the span was 25 through 50 years old while for the three physical science majors the age group was 25 and younger.

In the minority demographics, Physics had 7% minority majors, while Oceans and Geology had 8% minority majors matching national averages. Meteorology had no minority majors. The data sets are small but this trend points to the need to increase minority participation in majors programs. The department has consistently participated in minority recruitment days in the past.

3.0 General Education Objectives

- The table below indicates the degree to which the courses that are related to the programs under review demonstrate achievement of the General Education Objectives. Majors' courses are bolded. See the Appendix E for more information.
- The scale is 1 to 5 with 5 being the highest
 - Written communication
 - Oral communication
 - Scientific reasoning
 - Technological competence
 - Critical analysis and reasoning
 - Information literacy
 - Enhanced awareness of ethics, cultural diversity, artistic expression, health-and-wellness issues, and the physical and social environment.

Course	Written communication	Oral communication	Scientific Reasoning	Technological competence	Critical Analysis and reasoning	Informational Literacy	Culture Diversity Ethics Wellness
PHY 103	3	3	4	4	4	3	3
PHY 120	3	3	4	4	4	3	4
PHY 181	4	4	5	5	5	4	4
PHY 182	4	4	5	5	5	4	4
PHY 207	4	4	5	5	5	4	4
PHY 208	4	4	5	5	5	4	4
PHY 209	4	4	5	5	5	4	4
PSC 105	3	3	4	4	4	3	3
PSC 120	4	4	4	4	4	3	4
PSC	4	4	4	4	4	4	4

125							
PSC 135	4	4	4	4	4	4	4
PSC 140	4	4	4	4	4	4	4
PSC 150	4	4	4	4	4	4	4
PSC 220	4	4	5	5	5	4	4

3.1 Program Strengths

- Dedicated, well-rounded faculty support the programs, courses and the labs
- Physics is required for all sciences, engineering, and computer science majors
- Physical science courses are required for majors and electives for others
- All of the physics and physical science courses are classified as general education
- Currently Cecil College's science and engineering courses are acknowledged by four-year institutions as good preparation, transfer well, and are kept up-to-date by dedicated faculty
- Faculty advise students as well as help them find scholarships
- Faculty address future teaching career possibilities with students
- Recognized, quality general education core courses support easy transfer
- Rigorous math and science core courses offered by respective departments
- Well-equipped and supplied laboratories
- Lab classrooms structured for lectures and interactive learning
- All labs utilize the latest scientific software for modeling data and electronic sensors for data collection and analysis
- Administrations and community commitment to programs growth with a new Engineering, Physics and Mathematics building coming on board in September 2014
- Excellent IT support. Software programs are available on the college's server (Citrix) saving students money and providing easy access
- Administration supports updates to current software and technology
- Overlap of software and lab equipment for engineering and the physical sciences helps keep costs down
- Good relations with nearby four-year colleges and universities
- Low faculty / student ratio
- Administration supports tutoring
- Developing summer STEM bridge program for the sciences and engineering
- Professional development of faculty is encouraged
- Good relations with K-12 schools
- Library offers excellent support
- Adjuncts receive active support from full time faculty for courses and lab activities
- Adjuncts are actively encouraged to take part in curriculum improvement
- Day, night and hybrid class offerings
- Excellent student support services
- Course textbooks support applications in industry, society and the medical field
- Student evaluations and feedback from former students have been positive
- Course diversity is offered with content selections and different class modes
- Cost of education at Cecil is very affordable

3.2 Program Weaknesses

- Need for a lab coordinator/faculty member as new building will put strain on lab support
- Programs need more publicity and more effective delivery of publicity
- Students leave before degree completion (typical of science majors)
- New classes and programs take time to increase enrollment
- Lack of quiet study space for students
- Finding qualified adjuncts has been challenging
- Second full time faculty member (physics/electrical/geosciences) will be needed with new building and projected student population increase
- Need to further address students who are not online ready
- Increases in the tutoring budget is needed for physics and physical science students
- A faculty member should be given release time to manage the current labs and equipment

3.3 Program Opportunities

- Student population is drawn from quad-state area
- Cecil College's Foundation supports grants and scholarships for STEM students
- Close proximity to major industry (APG, DuPont, Gore, ATK, etc.) offers potential sources of internships and adjuncts
- A four-year engineering partner is being sought which will help strengthen the physical sciences
- The new Engineering-Physics-Math building will provide creative opportunities for enhanced learning in all classes. The machine shop will provide the equipment and spaces for project development
- Develop additional articulation agreements with four-year institutions
- Cecil has a vibrant music program that can be partnered with for interdisciplinary projects with physics and engineering
- Possibilities to work with transfer institutions on joint programs
- Grant and scholarship opportunities
- Physical science and engineering club could enhance student interest and help promote programs.
- STEM Speakers have been willing to come to our classes
- Faculty are developing materials for classes to save students money
- Proximity to amusement parks is an outside laboratory opportunity
- Proximity to aquariums, nature centers and caves bodes well for field trips
- Astronomy will be offered by the physics department in the spring with telescopes
- A new physical science course Energy and Renewability will be offered with dual listing (environmental science)
- Opportunities to work with biology, chemistry and environmental science for some cross pollination
- Opportunities to work with NASA ,UMBC and UMDCP as done in the past
- *Mathematica* has been added to department's software

3.4 Program Threats

- Rising textbook prices
- Need to remain vigilant to keep our courses strong and competitive. Physics education research and advances in technology are constantly changing the way introductory physics courses are taught
- There is an ongoing need for faculty training and workshop attendance to keep up with developments in the field, and with hardware and software.
- Class completion rates have been good for the physics and physical sciences in part due to the 16 students per lab cap. Students get individual attention and with smaller groups more challenging labs can be done. Going to a higher per class number of 20 is a direct threat to the quality of the student experience. Suggest student lab aid helpers.
- The new building classrooms have 24 lab seats. Lab aid personnel will be needed to maintain the safety of the labs, to keep continuity with the rigor of lab offerings, and to ensure students can all be served with the quality Cecil College is known for.
- Budget constraints have curtailed Math Lab hours, which affects test taking time opportunities for online students and affects tutoring opportunities for all students
- Writing Lab and Computer Lab hour reductions have hurt students
- New machine shop will necessitate qualified supervisory personnel and faculty training to insure student safety
- A mini student machine shop proficiency course (non-credit) will need to be developed for shop users to ensure safety
- High school physics and physical science preparation for college is significantly lower than mathematics or other sciences
- Recruiting science and engineering professionals as adjuncts with the offer of low pay (especially for small classes) is problematic
- Massive online classes might affect overall college course enrollment
- Articulation agreements with “for-profit” educational companies may hurt the quality reputation of Cecil College
- The new building is to go online in the Fall of 2014. Careful planning and answered help requests will be needed for a smooth transition.
- Physics, physical science, engineering, and computer science have been absorbed into the science department (loss of specialized attention)

4.0 Other Program Information

4.1 Advisory Council/Board

- An advisory board is not required for these programs, but having one for engineering will be helpful to physics and the physical sciences.

4.2 Adequacy of Available Technology

- The technology building classrooms lack Smart Boards but have full audiovisual and computer resources with white boards. The new building will have Smart Boards.
- Software packages are updated yearly
- Hardware is updated every 4 years. Engineering work stations are required for physics and engineering.
- Cecil College's Virtual Applications Server (CITRIX) makes engineering, math, and science software available to students.
- TC 322 has Apple TV while TC 323 lab does not.
- Two MHEC grants, two Perkins grants, and one TIME grant have helped with hardware and software purchases.
- Prior to this coming year, with 16 students, each student lab pair shared one computer.
- Adding 4 more students to the classroom to total 20, will strain resources as a lot of the data is collected with computer probes.
- Proper demonstration apparatus and equipment are available.

4.3 Adequacy of Facilities

- TC 322 and TC 323 classrooms in their current configuration support active learning and small group learning very well.
- The Computer lab is located down the hall from the physics/physical science classrooms.
- Math lab and Writing lab are available to students.
- No place for adjuncts in the technology center to put their belongings or study, but this will be rectified in the new building.
- Faculty offices near labs/classrooms, available for student help and advising.
- Current classroom structure supports lecture and lab activities coexisting in same space. Adequate ceiling height for hanging apparatus.
- Classroom cabinets are convenient for the setup and takedown of lab equipment.

4.4 Articulation Agreements

The table lists Cecil College's articulation agreements with three Universities. There are also articulation agreements for all majors with Wesley College and UMUC.

Cecil College Degree	College/University	Articulations Effective	Current Status
Physics	Lincoln University	May 29, 2012	On Going
Physics	Millersville Univ.	November 15, 2010	On going
Geology	Millersville Univ.	November 15, 2010	On going

Oceans	Millersville Univ.	November 15, 2010	On going
Meteorology	Millersville Univ.	November 15, 2010	On going
Electrical engineering	Morgan State Univ.	December 11, 2009	On going

5.0 Program Goals and Objectives

Program goals and objectives for the next five years are listed in the chart below.

Goals	Timetable for Completion	Required resources	Obstacles to Completion
1) Halftime machine shop/half time faculty person	As budget allows	Funding	Funding and building completion
2) Physics / Electrical faculty full time	As budget allows	Funding	Funding and building completion
3) Offer PHY 120 for VCP students and general population	Two to three years	Work with VCP to share software and hardware	Need to recruit instructor Lab supplies
4) Add projects to the physics curriculum	Ongoing	Machine shop, Faculty, industry and 4 year college consultations	New building opening Safety training programs for students and faculty Time and hiring personnel
5) Integrate Mathematica and Matlab exercises into curriculum	Ongoing	Faculty Training	Time to complete
6) A Physics, Geosciences and Engineering club	Two to three years	Faculty and volunteers Student Services	Time, startup funds, finding personnel

7) Offering Astronomy as a lecture course	Two years	Faculty and volunteers	Time, Secure a portable observatory
8) Improve STEM summer program	Two to three years	Faculty and volunteers	Time and finding personnel
9) Coordinate public viewing nights	Ongoing	Faculty and volunteers	Time and finding personnel
10) More effective publicity for all the programs	Ongoing	Cecil Marketing, Outreaches High School Advisors	Time to complete
11) Employ more relevant examples for all courses	Ongoing	Faculty commitment inside and outside department	Time to complete
12) Student satisfaction survey for physical sciences and engineering	Ongoing	Computer survey	Time to complete
13) Continue to address female and minority recruitment	Ongoing	Faculty, Advisors Marketing, Student Services	Coordinate effort

6.0 Recommendations

- Physics is an important service discipline with required core courses for the engineering programs, math, college sciences, computer science, education, technology, and provides electives for the liberal arts students. The data showing the growth of all these disciplines supports keeping the physics program.
- The physics program is an important STEM major in its own right and is important to the future technology of Maryland and the nation.
- The commitment and support to update labs, equipment, problem sets, and activities with the latest physics and geosciences pedagogy techniques must be ongoing.
- The Physical Sciences Geology, Meteorology, and Ocean Studies are important service disciplines to the college sciences, business, and liberal arts students' degrees and as such are recommended to be kept. The data of increasing growth supports the need.
- The Physical Sciences majors programs of Geology, Meteorology, and Oceans are important STEM majors in their own rights and also are important to the future technology of Maryland and the nation.

- As service programs to majors and non-science majors, physics and the physical sciences are doing a good job, but more can be done. The work of incorporating examples relevant to engineering, science fields, industry, and future teachers who take these courses must continue.
- For the majors programs increased effort must be made to attract and encourage more students, including women and minorities, to complete the Physics, Meteorology, Oceans and Geology degrees before transferring.
- Besides recruiting for the professional degrees it is important to recruit future teachers. Advisors, faculty, administration and PR need to renew efforts to work together for these goals
- Continue strong support and inclusion of adjuncts
- Continue outreach efforts with the schools, minorities, industry and the community
- Continue to maintain relations with the four year institutions and state committees
- Work on more articulations with 4-year institutions
- Stay the course with experiential learning and keep up to date
- Interact with the other sciences to insure that the physical sciences are serving their major's needs.
- Improve the summer STEM pre-engineering and pre-science bridge programs
- Utilize the opportunities that the new building will present
- To maintain the relevancy of the program to the students while meeting the needs of business/industry and the local economy, current licenses and faculty training must be maintained for the following software:
 National Instruments programs: LabView and Multisim
 Logger Pro, PASCO Capstone, Mindstorm Robotics, Statistics with Excel, Solid Works, AutoCad Suite, Mathematica and MatLab

Approvals

Signature of Division Chair Veronica Doyherty Date 9/9/13

Signature of the Chair of the [Signature] Date 12/18/2013
Academic Affairs Committee

Signature of the Dean of [Signature] Date 12-20-13
Academic Programs

Signature of the Chief Mary Wray Breet Date 1/2/14
Academic Officer

Appendix A

Demographic Data: Physics

Enrollment History

		Total Enrollment	Full-time	% of Total	Part-time	% of Total
<u>FY 2007/2008</u>	Summer 2007	2	0	0%	2	100%
	Fall 2007	1	1	100%	0	0%
	Spring 2008	2	1	50%	1	50%
<u>FY 2008/2009</u>	Summer 2008	1	0	0%	1	100%
	Fall 2008	3	2	67%	1	33%
	Spring 2009	2	2	100%	0	0%
<u>FY 2009/2010</u>	Summer 2009	4	0	0%	4	100%
	Fall 2009	6	3	50%	3	50%
	Spring 2010	4	4	100%	0	0%
<u>FY 2010/2011</u>	Summer 2010	3	0	0%	3	100%
	Fall 2010	5	2	40%	3	60%
	Spring 2011	5	1	20%	4	80%
<u>FY 2011/2012</u>	Summer 2011	4	0	0%	4	100%
	Fall 2011	4	1	25%	3	75%
	Spring 2012	5	2	40%	3	60%

Physics Students by Gender

	Total Enrollment	Female Students	% of Total	Male Students	% of Total
FY 2007/2008	4	1	25%	3	75%
FY 2008/2009	4	2	50%	2	50%

FY 2009/2010	7	3	43%	4	57%
FY 20010/2011	8	4	50%	4	50%
FY 20011/2012	5	2	40%	3	60%

Physics Students by Ethnicity

	Total Enrollment	African-American	American Indian	Asian	Hispanic	White	Unknown
FY 2007/2008	4	0 (0%)	0 (0%)	0 (0%)	0 (0%)	4 (100%)	0 (0%)
FY 2008/2009	4	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (75%)	1 (25%)
FY 2009/2010	7	0 (0%)	0 (0%)	0 (0%)	0 (0%)	5 (71%)	2 (29%)
FY 20010/2011	8	0 (0%)	0 (0%)	0 (0%)	0 (0%)	6 (75%)	2 (25%)
FY 20011/2012	5	1 (20%)	0 (0%)	0 (0%)	0 (0%)	3 (60%)	1 (20%)

Physics Students by Age

	Total Enrollment	Less than 25	26-30	31-40	41-50	51 and over
FY 2007/2008	4	3 (75%)	0 (0%)	0 (0%)	1 (25%)	0 (0%)
FY 2008/2009	4	4 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
FY 2009/2010	7	5 (71%)	1 (14%)	0 (0%)	1 (14%)	0 (0%)
FY 2010/2011	8	7 (88%)	1 (13%)	0 (0%)	0 (0%)	0 (0%)
FY 2011/2012	5	3 (60%)	2 (40%)	0 (0%)	0 (0%)	0 (0%)

Physics Degrees Awarded

	Total Degrees	Pell Recipients (from FY01)	% of Total
FY 2007/2008	0	0	0%
FY 2008/2009	0	0	0%
FY 2009/2010	0	0	0%
FY 2010/2011	0	0	0%
FY 2011/2012	2	1	50%
TOTAL	2	1	50%

Appendix B

Demographic Data: Meteorology

Enrollment History

		Total Enrollment	Full-time	% of Total	Part-time	% of Total
<u>FY 2007/2008</u>	Summer 2007	0	0	NA	0	NA
	Fall 2007	0	0	NA	0	NA
	Spring 2008	0	0	NA	0	NA
<u>FY 2008/2009</u>	Summer 2008	1	0	0%	1	100%
	Fall 2008	2	2	100%	0	0%
	Spring 2009	2	2	100%	0	0%
<u>FY 2009/2010</u>	Summer 2009	1	0	0%	1	100%
	Fall 2009	1	1	100%	0	0%
	Spring 2010	2	2	100%	0	0%
<u>FY 2010/2011</u>	Summer 2010	0	0	NA	0	NA
	Fall 2010	1	1	100%	0	0%
	Spring 2011	1	1	100%	0	0%
<u>FY 2011/2012</u>	Summer 2011	1	0	0%	1	100%
	Fall 2011	2	2	100%	0	0%
	Spring 2012	1	1	100%	0	0%

Meteorology Students by Gender

	Total Enrollment	Female Students	% of Total	Male Students	% of Total
FY 2007/2008	0	0	NA	0	NA
FY 2008/2009	2	0	0%	2	100%
FY 2009/2010	2	0	0%	2	100%

FY 20010/2011	1	0	0%	1	100%
FY 20011/2012	3	0	0%	3	100%

Meteorology Students by Ethnicity

	Total Enrollment	African-American	American Indian	Asian	Hispanic	White	Unknown
FY 2007/2008	0	0	0	0	0	0	0
FY 2008/2009	2	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (100%)	0 (0%)
FY 2009/2010	2	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (100%)	0 (0%)
FY 20010/2011	1	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (100%)	0 (0%)
FY 20011/2012	3	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (100%)	0 (0%)

Meteorology Students by Age

	Total Enrollment	Less than 25	26-30	31-40	41-50	51 and over
FY 2007/2008	0	0	0	0	0	0
FY 2008/2009	2	2 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
FY 2009/2010	2	2 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
FY 2010/2011	1	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
FY 2011/2012	3	3 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)

Meteorology Degrees Awarded

	Total Degrees	Pell Recipients (from FY01)	% of Total
FY 2007/2008	0	0	NA
FY 2008/2009	0	0	NA
FY 2009/2010	1	0	0%
FY 2010/2011	0	0	NA
FY 2011/2012	1	0	0%
TOTAL	2	0	0%

Appendix C

Demographic Data: Ocean Studies

Enrollment History

		Total Enrollment	Full-time	% of Total	Part-time	% of Total
<u>FY 2007/2008</u>	Summer 2007	0	0	NA	0	NA
	Fall 2007	0	0	NA	0	NA
	Spring 2008	0	0	NA	0	NA
<u>FY 2008/2009</u>	Summer 2008	0	0	NA	0	NA
	Fall 2008	1	1	100%	0	0%
	Spring 2009	1	1	100%	0	0%
<u>FY 2009/2010</u>	Summer 2009	0	0	NA	0	NA
	Fall 2009	3	3	100%	0	100%
	Spring 2010	1	1	100%	0	0%
<u>FY 2010/2011</u>	Summer 2010	2	0	0%	2	100%
	Fall 2010	4	3	75%	1	25%
	Spring 2011	4	4	100%	0	0%
<u>FY 2011/2012</u>	Summer 2011	1	0	0%	1	100%
	Fall 2011	5	2	40%	3	60%
	Spring 2012	3	1	33%	2	67%

Ocean Studies Students by Gender

	Total Enrollment	Female Students	% of Total	Male Students	% of Total
FY 2007/2008	0	0	NA	0	NA
FY 2008/2009	1	1	100%	0	0%
FY 2009/2010	3	3	100%	0	0%

FY 20010/2011	4	1	25%	3	75%
FY 20011/2012	5	2	40%	3	60%

Ocean Studies Students by Ethnicity

	Total Enrollment	African-American	American Indian	Asian	Hispanic	White	Unknown
FY 2007/2008	0	0	0	0	0	0	0
FY 2008/2009	1	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (100%)	0 (0%)
FY 2009/2010	3	1 (33%)	0 (0%)	0 (0%)	0 (0%)	2 (67%)	0 (0%)
FY 20010/2011	4	0 (0%)	0 (0%)	0 (0%)	0 (0%)	4 (100%)	0 (0%)
FY 20011/2012	5	0 (0%)	0 (0%)	0 (0%)	0 (0%)	5 (100%)	0 (0%)

Ocean Studies Students by Age

	Total Enrollment	Less than 25	26-30	31-40	41-50	51 and over
FY 2007/2008	0	0	0	0	0	0
FY 2008/2009	1	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
FY 2009/2010	3	3 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
FY 2010/2011	4	4 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
FY 2011/2012	5	5 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)

Ocean Studies Degrees Awarded

	Total Degrees	Pell Recipients (from FY01)	% of Total
FY 2007/2008	0	0	NA
FY 2008/2009	0	0	NA
FY 2009/2010	0	0	NA
FY 2010/2011	0	0	NA
FY 2011/2012	0	0	NA
TOTAL	0	0	NA

Appendix D

Demographic Data: Geology

Enrollment History

		Total Enrollment	Full-time	% of Total	Part-time	% of Total
<u>FY 2007/2008</u>	Summer 2007	0	0	NA	0	NA
	Fall 2007	1	0	0%	1	100%
	Spring 2008	1	0	0%	1	100%
<u>FY 2008/2009</u>	Summer 2008	0	0	NA	0	NA
	Fall 2008	1	0	0%	1	100%
	Spring 2009	1	0	0%	1	100%
<u>FY 2009/2010</u>	Summer 2009	0	0	NA	0	NA
	Fall 2009	1	1	100%	0	0%
	Spring 2010	2	2	100%	0	0%
<u>FY 2010/2011</u>	Summer 2010	0	0	NA	0	NA
	Fall 2010	1	1	100%	0	0%
	Spring 2011	1	1	100%	0	0%
<u>FY 2011/2012</u>	Summer 2011	0	0	NA	0	NA
	Fall 2011	0	0	NA	0	NA
	Spring 2012	0	0	NA	0	NA

Geology Students by Gender

	Total Enrollment	Female Students	% of Total	Male Students	% of Total
FY 2007/2008	1	1	100%	0	0%
FY 2008/2009	1	0	0%	1	100%
FY 2009/2010	2	1	50%	1	50%

FY 20010/2011	1	1	100%	0	0%
FY 20011/2012	0	0	NA	0	NA

Geology Students by Ethnicity

	Total Enrollment	African-American	American Indian	Asian	Hispanic	White	Unknown
FY 2007/2008	1	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (100%)	0 (0%)
FY 2008/2009	1	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (100%)	0 (0%)
FY 2009/2010	2	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (100%)	0 (0%)
FY 20010/2011	1	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (100%)	0 (0%)
FY 20011/2012	0	0	0	0	0	0	0

Geology Students by Age

	Total Enrollment	Less than 25	26-30	31-40	41-50	51 and over
FY 2007/2008	1	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
FY 2008/2009	1	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
FY 2009/2010	2	2 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
FY 2010/2011	1	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
FY 2011/2012	0	0	0	0	0	0

Geology Degrees Awarded

	Total Degrees	Pell Recipients (from FY01)	% of Total
FY 2007/2008	0	0	NA
FY 2008/2009	0	0	NA
FY 2009/2010	0	0	NA
FY 2010/2011	1	1	100%
FY 2011/2012	0	0	NA
TOTAL	1	1	100%

Appendix E

Program Outcomes	Student Learning Outcomes	Direct/Indirect Assessment Measure	Population	Reporting/Use
A. Students who complete the College's General Education Core Requirements will demonstrate college-level competency in critical and creative thinking skills and problem-solving strategies.	1. Students will identify, categorize and distinguish among elements of ideas, concepts, theories and/or practical approaches to standard problems. 2. Students will analyze, evaluate, and/or criticize various academic disciplines and/or regional/national/global issues.	a. Written Essays b. Tests c. Final Exams d. Projects e. Multimedia Presentations f. Lab reports g. Lab activities	Students in all below courses, PHY 103, PHY 120 PHY 181, PHY 182 PHY 207, PHY 208 PHY 209, PSC 105 PSC 120, PSC 125 PSC 135, PSC 140 PSC 150, PSC 220	2011 – CCLA results 2012 CCSSE results 2013 – CCLA results Used to determine course grade
	1. Students will demonstrate accurate and effective explanatory writing skills. 2. Students will locate, collect and organize evidence on an assigned research topic.	a. Written Essays b. Tests c. Final Exams d. Projects e. Multimedia	Students in all below courses PHY 103, PHY 120 PHY 181, PHY 182 PHY 207, PHY 208	2011 – CCLA results 2012 CCSSE results 2013 – CCLA results 'C'Standards rubric results

Program Outcomes	Student Learning Outcomes	Direct/Indirect Assessment Measure	Population	Reporting/Use
		Presentations f. Lab reports g. Lab Activities	PHY 209, PSC 105 PSC 120, PSC 125 PSC 135, PSC 140 PSC 150, PSC 220	Used to determine course grade
C. Students who complete the College's General Education Core Requirements will demonstrate college-level competency in oral communications.	1. Students will demonstrate effective public speaking skills. 2. Students will demonstrate an ability to evaluate their own public speaking skills.	a. Discussions e. Formal Oral Presentations f. Multimedia Presentations g. Lab reports h. Lab activities	Students in all below courses PHY 103, PHY 120 PHY 181, PHY 182 PHY 207, PHY 208 PHY 209, PSC 105 PSC 120, PSC 125 PSC 135, PSC 140 PSC 150, PSC 220	Oral presentation rubric results 2012 CCSSE results Used to determine course grade
D. Students who complete the College's General Education Core Requirements will demonstrate college-level competency in quantitative analysis.	1. Students will demonstrate understanding of mathematical principles and methods. 2. Students will demonstrate the ability to perform accurate calculations and symbolic	b. Projects c. Tests d. Final Exams e. Projects	Students in all below courses PHY 103, PHY 120 PHY 181, PHY 182	2011 – CCLA results 2012 CCSSE results 2013 – CCLA results

Program Outcomes	Student Learning Outcomes	Direct/Indirect Assessment Measure	Population	Reporting/Use
	operations.	f. Lab Reports f. Lab Activities	PHY 207, PHY 208 PHY 209, PSC 105 PSC 120, PSC 125 PSC 135, PSC 140 PSC 150, PSC 220	Math rubric results Used to determine course grade
<i>E. Students who complete the College's General Education Core Requirements will demonstrate college-level competency in computer literacy and in the ability to work productively with information technology.</i>	1. Students will demonstrate the ability to determine or calculate the solution to a problem through the use of computer technology. 2. Students will demonstrate the ability to make effective use of writing-related computer technology.	a. computer mathematical modeling of data and simulations a. Information Technology Assessment tool b. Papers c. Tests d. Final Exams e. Projects f. Team-oriented Activities g. CCSSE	Students in all below courses PHY 103, PHY 120 PHY 181, PHY 182 PHY 207, PHY 208 PHY 209, PSC 105 PSC 120, PSC 125 PSC 135, PSC 140 PSC 150, PSC 220	2012 summer bridge program pilot of Information Technology Assessment tool results Subsequent use of Information Technology Assessment tool 2012 CCSSE results Used to determine course grade

Program Outcomes	Student Learning Outcomes	Direct/Indirect Assessment Measure	Population	Reporting/Use
F. Students who complete the College's General Education Core Requirements will demonstrate college-level competency in awareness of ethics, cultural diversity, artistic expression, health-and-wellness issues, and the physical and social environment.	<p>1. Students will demonstrate an awareness of ethical behavior.</p> <p>2. Students will demonstrate an understanding of and appreciation for cultural diversity.</p> <p>3. Students will demonstrate understanding of and appreciation for artistic expression.</p> <p>4. Students will demonstrate understanding of and appreciation for health-and-wellness issues.</p> <p>5. Students will demonstrate understanding of and appreciation for the physical and social environment.</p>	<p>a. Papers</p> <p>b. Tests</p> <p>c. Final Exams</p> <p>d. Projects</p> <p>e. Team-oriented Activities</p> <p>f. CCSSE</p>	<p>Students in all below courses</p> <p>PHY 103, PHY 120</p> <p>PHY 181, PHY 182</p> <p>PHY 207, PHY 208</p> <p>PHY 209, PSC 105</p> <p>PSC 120, PSC 125</p> <p>PSC 135, PSC 140</p> <p>PSC 150, PSC 220</p>	<p>Spring 2012 CCSSE results</p> <p>Used to determine course grade</p>
G. Students who complete the College's General Education Core Requirements will demonstrate college-level	<p>1. Students will identify, categorize, and evaluate multiple information resources.</p>	<p>a. Information Technology Assessment tool</p>	<p>Students in all below courses</p> <p>PHY 103, PHY 120</p>	<p>2012 summer bridge program pilot of Information Technology Assessment tool results</p>

Program Outcomes	Student Learning Outcomes	Direct/Indirect Assessment Measure	Population	Reporting/Use
<i>competency in information literacy including finding, evaluating, and using information effectively.</i>	2. Students will cite multiple information resources in various course assignments.	b. Papers c. Tests d. Final Exams e. Projects f. Multimedia Presentations g. Team-oriented Activities h. Capstone projects i. CCLA j. CCSSE	PHY 181, PHY 182 PHY 207, PHY 208 PHY 209, PSC 105 PSC 120, PSC 125 PSC 135, PSC 140 PSC 150, PSC 220	Subsequent use of Information Technology Assessment tool 2011 – CCLA results 2012 CCSSE results 2013 – CCLA results Used to determine course grade



