

Comprehensive Program Review ***Instructions, Reporting Vehicle, and Definitions***

Reporting Vehicle

Institution: Columbus State University

Academic Program Name: Earth and Space Science

CIP Code: 40069901

College or School and Department: College of Letters and Sciences

Date of Last Internal Review: May 3, 2007

Current Date: July 13, 2017

Outcome of Previous Program Review

Since its implementation in 2009, the BS in Earth and Space Science (ESS) program has become one of the most productive in the University System in terms of degrees conferred. In FY2016, only the University of Georgia and Georgia State University awarded more Earth and Space Science degrees, with ESS conferring more degrees than all other State and Comprehensive Universities in the USG. Compared to other CSU baccalaureate program, enrollment in the BS Earth and Space Science program is relatively small (lower third of 37 programs), typical of U.S. undergraduate programs in the physical sciences and science technologies. For majors in these fields (astronomy, meteorology, geology, chemistry, physics, etc.) degrees conferred across the U.S. has changed very little over the past 4 decades. Enrollment in ESS has decreased 15% over the past four years: AY 2013 (80 students) and AY 2016 (68 students).

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Indicators of Measures of Quality:			
Student Input – Undergraduate Programs	AY 2013	AY 2014	AY 2015
Standardized Test Scores (if applicable), for undergraduate programs -- ACT or SAT – Choose the standardized examination used and indicate in the space provided below: Number of Students Reported (Total N):	SAT 1055 ACT 21 (N) 8 (N) 7	SAT 1034 ACT 22 (N) 7 (N) 4	SAT 1133 ACT 23 (N) 3 (N) 4
Freshman Index (as applicable)	SAT 2689 ACT 2739	SAT 2525 ACT 2466	SAT 2995 ACT 2621
Other - Institutions may substitute other measures of quality (e.g. entry scores or GPA into a degree program such as nursing, business, education) as appropriate. Please briefly discuss what the measure(s) are and how they are defined. HSGPA	2.99	2.91	3.16
Student Output – Undergraduate Programs	AY 2013	AY 2014	AY 2015
Average Graduating Major GPA or Cumulative GPA for the Academic Year. Please indicate which GPA is used: Cumulative GPA Also indicate the number of students reporting scores for the test(s) (Total N):	3.19 (N) 11	3.22 (N) 9	3.16 (N) 11
Employment rates of graduates (if available)	2010-2017 Graduate School - 15 Employed – 22 Applied to graduate school - 1		
Admission into graduate programs (if available) -1 year past graduation - Clearinghouse	-	45%	44%
Student Output – University Determined: Student Research Projects <ul style="list-style-type: none"> From spring 2014 through spring 2016, almost three-quarters (73%) of all graduates from the BS Earth and Space Science degree program participated in an undergraduate research project, internship, or completed a senior thesis. From spring 2014 through spring 2016, approximately half of BS Earth and Space Science graduates co-authored one or more publications with departmental faculty prior to graduation. In FY2016 alone, ESS students secured funding for 8 different Student Research and Creative Endeavors grants from the Office of the Provost. 			

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Institutional Indicators of Quality- Student Output (campus determined). Please define what Indicators are used and how they are interpreted. **NSSE 2013 Results for Earth and Space Science.**

It is evident from the NSSE results that students feel academically challenged; engage in positive faculty interactions; experience a quality and supportive campus environment; engage in collaborative learning; and discuss learning with a diverse peer population.

ITEM	ESS	CSU	USG	Comp Peers	Asp Peers
Academic Challenge					
Higher Order Learning	60	43.3	42.3	41.1	40.4
Reflective and Integrative Learning	50	39.2	39	38.2	38.4
Learning Strategies	60	42.5	43.2	42.3	39.3
Quantitative Reasoning	60	27.8	31.	29.9	30.1
Experiences with Faculty					
Student-Faculty Interaction	47.5	24.2	26.7	23.0	24.4
Effective Teaching Practices	56.0	41.7	41.7	41.4	40.5
Campus Environments					
Quality of Interactions	45.0	42.9	43.4	42.8	42.2
Supportive Environments	50.0	33.1	35.1	32.6	34.1
Learning with Peers					
Collaborative Learning	55.0	31.0	34.3	31.7	34.2
Discussion with Diverse Others	60.0	44.1	42.5	43.7	41.6

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Faculty	AY 2013	AY 2014	AY 2015
Number of Terminally Degreed Faculty in the Department	10	11	11
<p>Undergraduate programs: Total amount of sponsored research funding awarded for the academic year From FY2012-FY2016, ESS faculty acted as PI or co-PI on external grants that yielded more than 3.4 million dollars in awards. This included:</p> <p>1) 2.6 million dollars in grants awarded to Dr. Kimberly Shaw and co-PI's in Education and Math for the UTeach and CRAFT-STEM initiatives.</p> <p>2) \$641,000 awarded to the "Tip of the Mitt" Council by the Environmental Protection Agency in order to improve invasive species control techniques in the Great Lakes; a grant co-written by Dr. Troy Keller.</p> <p>3) \$126,000 awarded to Dr. Clinton Barineau by the National Science Foundation to study the tectonic and magmatic evolution of the southernmost segment of the southern Appalachian Mountains, which funded 8 undergraduate research projects and theses.</p> <p>4) Continuing funding to Dr. Rosa Williams through NASA's Space Grant, which funds multiple student internships each year at the Coca Cola Space Science Center.</p>			
Undergraduate programs: Number of peer-reviewed publications for the academic year.	From FY2012-FY2016 130 books, peer-reviewed journal articles, technical documents, conference papers and published abstracts.		
Undergraduate programs: Number of faculty research fellowships awarded in the academic year. This is internal faculty fellows	0	0	0 *4 in 2016
Institutional Indicators of Faculty Quality- Output (campus determined) Please define what Indicators are used and how they are interpreted. Faculty Outputs include teaching evaluation scores, faculty awards, and recognitions (see below).	4.39 out of 5 for quality instruction for 2015-2016		

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Faculty Awards and Recognitions

Dr. Andrew Puckett, Assistant Professor of Astronomy
2016 Outstanding Student Mentor, Columbus State University Honors College

Dr. Kimberly Shaw, Professor of Physics
2015 Georgia Professor of the Year, Council for Advancement and Support of Education
2015 Rod Nave award, Southeastern Association for Science Teacher Education

Dr. Troy Keller, Professor of Environmental Science
2014-2015 William Chappell Graduate Faculty Award, Columbus State University

Dr. Clinton Barineau, Associate Professor of Geology
2015-2016 Faculty Research and Scholarship Award, Columbus State University
2012-2013 Educator of the Year, Columbus State University
2012-2013 Faculty Fellow of Outstanding Teaching, College of Letters and Sciences, Columbus State University

Dr. David Schwimmer
2012-2013 Faculty Fellow of Outstanding Research, College of Letters and Sciences
2002-2003 Faculty Research and Scholarship Award, Columbus State University

Dr. Shawn Cruzen, Professor of Astronomy
2003-2004 Educator of the Year, Columbus State University
1998-1999 Educator of the Year, Columbus State University

Excellence in Research Faculty in the BS Earth and Space Science program also engage in high caliber research, much of which includes undergraduate student collaborators. From FY2012-2016, ESS faculty have given more than 70 conference presentations and published over 130 books, peer-reviewed journal articles, technical documents, conference papers and published abstracts – including more than 40 with student coauthors. During this same time period, more than one-third of BS Earth and Space Science graduates completed senior theses, with more than 10% of graduating students completing an honors thesis during this time.

External Quality Assurance (e.g. professional accreditation surveys; market ratings). **University Defined - Stakeholder's Satisfaction with the program**

Current Students

Qualitative assessments suggest BS Earth and Space Science students are generally satisfied with our program. This is primarily based on personal communications to individual ESS faculty members, but was also expressed in statements to the external reviewer... "The students interviewed consistently voiced a high level of satisfaction with the faculty, courses, degree programs and the department as a whole. Especially noteworthy was a high level of comradery and sense of community. For example, one student was concerned that most CSU students didn't know about her degree program (geology) and "how great it is." These attitudes seem closely tied to the high level of personal involvement of the faculty and also to the bonding that has occurred through shared off-campus educational (e.g. "Maymester trip") and research experiences. Such comradery is associated with several positive educational outcomes: retention of students who might otherwise

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transfer to other degree programs/universities, encouragement of students struggling with academic/financial difficulties, student continuation in advanced degree programs, and eventual alumni involvement.”

Alumni

An “Alumni Satisfaction Survey” sent to the 54 BS Earth and Space Science students who graduated since summer 2012 (first graduating class) was completed by 18 students (33.33% response rate). The results of this anonymous survey were overwhelmingly positive.

- On a scale from 1 (highly dissatisfied) to 100 (highly satisfied), these 18 alumni rated their undergraduate experience in the Department of Earth and Space Science as a 93 (average) with only 3 students rating their experience below a 90 (lowest score was 70).
- On a scale from 1 (poorly prepared) to 100 (well prepared), these 18 alumni rated their preparation in the BS Earth and Space Science program for life beyond their undergraduate degree as an 87 (average) with only 3 students rating their experience below an 85 (lowest score was 30).

Graduate Programs Accepting BS Earth and Space Science Students

More than 37% of students graduating from the BS Earth and Space Science program had completed or were enrolled in a graduate program at the time of this report (20 students in total). Although many remained at CSU (MS Environmental Science/MS Natural Science program), more than half of this group (11 students) were accepted at a variety of institutions across the U.S., including the University of Georgia, Auburn University, University of Florida, Florida State University, Penn State, Vanderbilt, Colorado School of Mines, and the New Mexico Institute of Mining and Technology. Feedback from colleagues at these graduate programs (where available) are overwhelmingly positive, with some institutions (e.g. Auburn University) actively recruiting our BS students during visits to CSU’s main campus. Source: personal communications, letter from Dr. Mark Steltenpohl (Chair, Department of Geoscience, Auburn University).

Employers Hiring BS Earth and Space Science

Nearly 41% of students graduating from the BS Earth and Space Science program (22 total) were employed in a field related to their discipline at the time of this report. This represents >65% of ESS students who were not pursuing a graduate degree at the time of this report. Additionally, this number is a minimum due to the fact that the whereabouts of some graduates are currently unknown. Although we do not have written feedback from the employers of these graduates, at least 2 local companies – Innovar Environmental, Inc. and Building and Earth Science – have hired multiple ESS graduates over the past 5 years. Innovar, for example, currently employs 5 graduates of the BS Earth and Space Science program, while Building and Earth Science employs 2 graduates. ESS alumni in these companies have been promoted during their employment, suggesting these companies are satisfied with them as employees.

Curricular Alignment and Currency to the Discipline as well as Workforce/Occupational Need and Demand

The BS Earth and Space Science program addresses student needs for pursuit of an advanced degree or employment in the private/public sector following completion of their baccalaureate. Demand for students with backgrounds in degrees of this nature is both strong and growing. Employment of Physicists/Astronomers and Geoscientists is expected to experience growth of 7% and 10%, respectively, from 2014-2024 (US Bureau of Labor Statistics).

Graduates of the Astrophysics and Planetary Geology concentration typically pursue employment or advanced degrees in the fields of Physics, Astronomy, and Geology. Of the 8 students who graduated from this concentration during the study period.

- 1) Three students were accepted into Astronomy graduate programs (Louisiana State University, University of Tennessee, and Vanderbilt)

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- 2) Three students were accepted into Geology or Geophysics graduate programs (New Mexico Institute of Mining and Technology, Columbus State University), with one becoming successfully employed with a US Geological Survey following graduation.
- 3) One student was accepted into an Environmental Science graduate program (Columbus State University)
- 4) One student is currently applying to graduate programs in Astronomy.

Graduates of the Environmental Science concentration typically become employed in the field of Environmental/Geotechnical Engineering and as Environmental Scientists/Technicians. Of the 12 students who graduated from this concentration over the reporting period. Employment of Environmental Scientists and Environmental Technicians is expected to experience growth of 11% and 9%, respectively, from 2014-2024 (US Bureau of Labor Statistics).

- 1) Six students were employed in the field of Environmental Science, either with a private company conducting environmental assessment/environmental compliance activities, or a public entity (e.g. GA Department of Natural Resources).
- 2) One student enrolled in an Environmental Science graduate program (Columbus State University)
- 3) One student was employed in a field unrelated to their degree.

Graduates of the Geology concentration are just as likely to be employed in a field related to geology as they are to have enrolled in a Geology graduate program. Of the 27 students who graduated from this concentration over the reporting period. Employment of Geoscientists, Environmental Scientists and Environmental Technicians is expected to experience growth of 10%, 11% and 9%, respectively, from 2014-2024 (US Bureau of Labor Statistics).

1. Nine students were employed in the field of Environmental/Geotechnical Engineering with a private company, or were employed with a government entity conducting environmental assessment/compliance (e.g. Environmental Protection Agency).
2. Five students enrolled in a Geology graduate program (Auburn, Columbus State University, University of Georgia, Colorado School of Mines, New Mexico Institute of Mining and Technology, University of Florida, Florida State University, Penn State)
3. One student was employed with an energy exploration company.
4. Five students were employed in fields unrelated to their degree (e.g. family business)

Two graduates of the Secondary Education concentration became employed as a Secondary Education teacher and two were unknown at the time of this report.

1. Curriculum in the Secondary Education concentration is aligned with the nationally recognized UTeach program. UTeach teacher education programs have been endorsed by a number of organizations, including the Association of Public and Land Grant Universities, the National Academies Commission, and the Presidential Council of Advisors on Science and Technology.
2. High teacher turnover rates coupled with decreasing enrollment in teacher certification programs, both in Georgia and nationwide, have led to widely publicized efforts to produce more STEM teachers across the U.S.
3. Ongoing and projected shortages in Georgia school systems, especially in the STEM areas, mirror nationwide trends.

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Indicators of Measures of Viability:			
<i>Internal Demand for the Program</i>	AY 2013	AY 2014	AY 2015
Number of students who completed an application to the program (if an applicable process is in place)- Institution determines the milestone for reporting purposes (e.g. point in time formal applications are reviewed and acceptances are granted)	25	22	13
Number of students who are admitted to the program --- Institution determines the milestone for reporting purposes (e.g., formal admittance to a degree program)	12	14	6
Number of students in the degree program --- Institution determines the milestone for reporting purposes	80	71	70
Standard Faculty Workload for the degree program (example: 3/3, 4/3, etc.)	3/3	3/3	3/3
Number of Faculty (tenured/track and non-tenured) supporting the degree program outside the department	11	11	11
Number of Full-Time faculty teaching in the program	15	15	15
Number of Part-Time faculty teaching in the program	2	2	2

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Indicators of Measures of Productivity:			
<i>Time to Degree</i>	AY 2013	AY 2014	AY 2015
Undergraduate student time to degree (average, in years) for non-transfer students graduating in the academic year (AY)	4.73	4.29	4.84
Undergraduate student time to degree (average, in years) for transfer students graduating in the academic year (AY)	3.69	3.58	4.58
<i>Graduation - Only provide data for the level of program being reviewed.</i>	AY 2013	AY 2014	AY 2015
Number of degrees awarded in the program for the academic year.	N/A	8	7
Credit Hour (Campus Determined)	6,329	6,231	7,142

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Provost/VPAA Categorical Summation:

Check any of the following to categorically describe action(s) the institution will take concerning this program.

Program MEETS Institution's Criteria

Program is critical to the institutional mission and will be retained.

Program is critical to the institutional mission and is growing or a high demand field and thus will be enhanced.

Program DOES NOT MEET Institution's Criteria

Program will be placed on a monitoring status.

Program will undergo substantive curricular revisions.

Program will be deactivated.

Program will be voluntarily terminated.

Other (identify/add text): _____

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Contextual Closing Narrative: In the space provided below (*and can be expanded*), provide a summative narrative concerning the academic program. The final statement, among other points, includes information concerning the academic program's achievements, benchmarks of progress, and areas of distinction, challenges, and aspirations, in addition to plans for action. Please share how comprehensive program review results were used for continuous improvement. The closing statement also is an opportunity to highlight shifting trends and market forces that might impact program demand (1,500 word limit).

The BS program in Earth and Space Science (ESS) includes concentrations in Astrophysics and Planetary Geology, Environmental Science, and Geology offered through the Department of Earth and Space Science, with a fourth concentration in Secondary Education. All tenure and tenure-track faculty within the Department of Earth and Space Science possess terminal degrees in their field. Over 90% of credit hours generated in the ESS department from FY2012 through FY2016 were in 1000- level and 2000-level courses.

ESS needs to work on increasing enrollment in the program. The program has decreased enrollment by 15% over the past four years. In Fall 2012, the program had 80 students and in Fall 2016, the program had 68 students. Further, the students enrolled in the program are not progressing toward degree completion which is reflected in the number of students who graduate per year. The first-time full-time retention rates for students who enrolled in fall/summer of preceding year and returned the next fall include: 71.4% (5 students) for Fall 2013 cohort; 66.7% (2 students) for Fall 2014 cohort; and 77.8% (7 students) for fall 2015 cohort. Graduation rates includes: 50% (1 student) in 2013; zero in 2014; and 33% (1 student) in 2015.

Program Improvement Plan

1. Increase enrollment in the program by collaborating with Enrollment Services to address the 15% decline over the past four years.
2. Develop a plan that supports retention of students from entry to graduation.
3. Identify "at-risk" students by utilizing EAB and collaborating with the Academic Center of Excellence to increase student retention and progression.
4. Develop assessment tools to evaluate curriculum and student learning outcomes.
5. Mentor new faculty through a university-wide "New Faculty Workshop" developed by the Faculty Center for the Enhancement of Teaching and Learning, and enhance departmental mentoring.
6. Improve faculty diversity (gender and race) in the department as new searches are conducted.
7. Develop and implement a faculty workload policy by AY 2018.
8. Implement a peer-based classroom evaluation system.

Provost/VPAA Signature and Date: _____

Lina Butler

7/14/17

----- OR -----

Provost/VPAA's Designee Signature and Date: _____