

Undergraduate Curriculum Review of the School of Earth and Atmospheric Sciences

Based on a review of the self study from the School of Earth and Atmospheric Sciences, the external review committee's report, and materials from the Georgia Institute of Technology course catalogue, we present here a review of the undergraduate curriculum of the School of Earth and Atmospheric Sciences.

I. Overall Program Quality

The School of Earth and Atmospheric Sciences offers undergraduate degree(s) in BS in Earth and Atmospheric Sciences, and undergraduate minor and certificate in geochemistry and geophysics. As the School states in its self-study, the mission statement of the School of Earth and Atmospheric Science is:

The School of Earth and Atmospheric Sciences observes, quantifies, and predict the earth system and its components, an so

- conducts fundamental and innovative research in earth and atmospheric sciences as well as in interdisciplinary research areas;
- educates those who will pioneer the advancement of knowledge in earth and atmospheric sciences and to be the future leaders of academia, government, and industry;
- contributes to the education of Georgia Tech students so as to promote understanding of the earth and environmental issues in society;
- provides, through outreach and partnerships, applications of our research to improve health, environmental sustainability, prosperity and security both locally and internationally.

A. Viability of the Program: The undergraduate program in the School of Earth and Atmospheric Sciences is viable as indicated by:

- The EAS program currently has 49 majors. The incoming freshman class of 2003 represented the best recruiting year in the history of the program as 19 new incoming freshman selected EAS as a major. Historically, the EAS program has maintain the number of majors at nearly 45. However, in 2000 the number dropped significantly to 36 but has steadily increased over the subsequent 3 years leveling off at 49 in 2004.
- There appears to be consistent demand for the EAS program, but relative to other Schools in the College of Science the EAS program has only half as many majors as the next smallest program in the College of Sciences.

- Retention in the EAS program has been generally good. In fact, EAS has experienced a lower attrition rate than the Georgia Tech average. The self-study suggests that this favorable retention rate can be attributed to the School's hiring of a Director of Student Affairs.

B. Success of the Program: The undergraduate program in the School of Earth and Atmospheric Sciences is successful as indicated by:

- The School of Earth and Atmospheric Sciences has graduated 80 students since its inception. The School provides information on 54 of their graduates.
- Approximately 50% of graduates have gone on to graduate degree programs. Half of the students entering graduate programs have pursued areas of study that are directly related to earth and atmospheric sciences in Universities that include Georgia Tech, Dartmouth, Penn State, Harvard, Scripps and Virginia Tech. The other half of students going to graduate school have pursued degrees that include law, business, public policy, architecture, international affairs, city planning, urban ecology and electrical engineering.
- Students have found employment immediately after graduation in environmental consulting firms, the National Weather Service, the Environmental Protection Agency, university research groups, the Rand Corporation, the Atlanta Regional Commission, software companies, GE Power Systems, Georgia Department of Environmental Quality, the Peace Corps, and the military.
- The self study offers no comparison of the School graduates to those of other leading EAS programs.
- There is no student based review data reported in the self-study.

II. Process for Maintaining Program Quality

The School of Earth and Atmospheric Science has a purposive, intentional design for the learning experiences of undergraduates that leads to the success described earlier. The design of the program leads to desired learning objectives and is assessed in a systematic manner which informs the iterative re-design and re-development of the undergraduate students' learning environments.

A. Learning Objectives: The undergraduate program in the School of Earth and Atmospheric Sciences makes clear the learning objectives for the students in their program(s). Some of these objectives include:

- Graduates will have a firm understanding of the basic principles of Science (physics, chemistry, and biology) and mathematic/computing, and skills to communicate these principles.
- Graduates will have a firm understanding of basic environmental science and the fundamental principles of earth science.

- Students will understand the earth system, backed up by the practical skills that will enable them to effectively participate in research.
- Graduates will have the skills needed to be productive members of the technical environmental community.
- Graduates will have the basic educational foundation necessary to pursue a program of graduate study in the environmental Earth System Science.
- Graduates will be introduced to contemporary environmental science issues,

B. Design of the Program: The undergraduate learning experiences in the School of Earth and Atmospheric Sciences are designed to be purposive, cohesive, and cumulative. The courses and requirements of the program lead to the desired learning objectives. The program makes sense, and the successive semesters of the program build toward a successful graduate.

- Through its web-site and self-study the School provides clear and concise direction as to how students can successfully matriculate the program. However no clear justification is provided as to why the curriculum take its' present form nor is the sequencing or purpose for each course connected to the programs stated objectives.

C. Assessment Methods: Faculty in the School of Earth and Atmospheric Sciences are able to monitor the successful implementation of the program (e.g., that the design experiences realized by graduates lead to the learning objectives) through a successful assessment program implemented in the School. The assessment methods are directly linked to the learning objectives and provide insight into the quality of the program. The results from these methods make a convincing case that the group-level student achievement meets the desired objectives.

The assessment methods include:

- end of semester course evaluations
- analysis of enrollment and retention statistics
- exit survey of graduating seniors
- exit interviews of graduating seniors with the Chair
- monitoring of post-graduate employment and education placement
- surveys given to all undergraduate students
- monitoring of individual student progress
- performance in capstone courses

D. Review Process: The School of Earth and Atmospheric Sciences has implemented a process of review by which faculty are informed at regular intervals about the results of the assessment methods and of revision of the program design when needed to meet the learning objectives.

- Faculty in the School of Earth Atmospheric Sciences are informed through survey results and evaluations results which are presented each year in the annual

assessment report prepared by the Undergraduate Coordinator and the School's Chair. However, there is no formal mechanism in which an on-going assessment process is implemented. In fact the entire assessment process appears to be an after-thought.

III. Recommendations

Based on this review, the Institute Undergraduate Curriculum Committee makes the following recommendations for further success of the undergraduate program in the School of Earth and Atmospheric Sciences.

Recommendation 1: The assessment of the EAS undergraduate program is clearly underdeveloped. The process should include input from students as well as a method for consistent faculty participation. The current assessment process provides useful information but there is no evidence presented in the self-study that suggests that the information is consistently used by the faculty or the School's administration to improve the program. An on-going integrated assessment process must be developed for the EAS undergraduate degree program.

Recommendation 2: The process for completing an undergraduate major in EAS is well documented but the curricula sequences are not related to program goals and outcomes. The self study should contain clear and explicit explanations as to how the curriculum design achieves stated goals and expected outcomes.

Recommendation 3: The number of undergraduate majors in EAS is about one half the size of the next smallest program in the College of Sciences. Given the size of the faculty, and the expenditures necessary to maintain a School of Earth and Atmospheric Sciences it is important to have a stable undergraduate program that at least compares favorably with other programs in the College.

Recommendation 4: The School of Earth and Atmospheric Sciences should examine closely the possibility of developing joint degree programs with Schools outside of the College of Sciences.