Program Review

BS in Integrated Science and Technology

College of Science

November 2009

MARSHALL UNIVERSITY

Program Review
Marshall University

Date: ___11/1/2009_____

Program: __BS in Integrated Science and Technology_____
Degree and Title

Date of Last Review: __November 209_____

Recommendation

Marshall University is obligated to recommend continuance or discontinuance of a program and to provide a brief rationale for the recommendation.

Recommendation
Code (#):

1. Continuation of the program at the current level of activity; or

2. Continuation of the program at a reduced level of activity or with **corrective action**: Corrective action will apply to programs that have deficiencies that the program itself can address and correct. **Progress report due by November 1 next academic year;** or

3. Continuation of the program with identification of the program for **resource development:** Resource development will apply to already viable programs that require additional resources from the Administration to help achieve their full potential. This designation is considered an investment in a viable program as opposed to addressing issues of a weak program. **Progress report due by November 1 next academic year**; or

4. Development of a cooperative program with another institution, or sharing of courses, facilities, faculty, and the like; or

5. Discontinuation of the program

Rationale for Recommendation: (Deans, please submit the rationale as a separate document. Beyond the College level, any office that disagrees with the previous recommendation must submit a separate rationale and append it to this document with appropriate signature.)

____1_____	____Mike Little____Brian Morgan_____	__11/1/2009____
Recommendation:	Signature of person preparing the report:	Date:
____1_____	____Mike Little_____	__11/1/2009_____
Recommendation:	Signature of Program Chair:	Date:
____1____	____Charles Somerville_____	___11/1/2009____
Recommendation:	Signature of Academic Dean:	Date:
____1____	____Tracy Christofero_____	___11/13/2009___
Recommendation:	Signature of Chair, Academic Planning Committee: (Baccalaureate pgms only)	Date:
____1____	____Camilla Brammer_____	___1/28/2010____
Recommendation:	Signature of President, Faculty Senate/ Chair, Graduate Council:	Date:
_____	_____	_____
Recommendation:	Signature of the Provost and Senior Vice President for Academic Affairs:	Date:
_____	_____	_____
Recommendation:	Signature of the President:	Date:
_____	_____	_____
Recommendation:	Signature of Chair, Board of Governors:	Date:

Instructions to Program Regarding the Follow-Up Report

In December 2008, the Academic Planning Committee requested that the BS in Integrated Science and Technology develop a more complete assessment plan.

Preliminary Report: Status of Assessment for Degree Programs in Integrated Science and Technology and Environmental Science

Submitted by:
Brian Morgan
Mike Little
November 1, 2009

Program's Mission:
The Undergraduate Degree Programs in Integrated Science and Technology (IST) and Environmental Science (ES) are in compliance with all aspects of Marshall University (MU) and Marshall University College of Science (MU COS) core requirements. Consequently, students in these two degree programs learn the same MU and COS core content, the same way, for the same reasons as students in other programs. However, IST and ES students are also participants in an educational experience that is integrative at two levels and prepares them to participate in a workforce that routinely applies sound scientific operations and does so with the latest and most effective technologies. This integration of scientific operation and technical competence involves three unique curricular divisions: the IST Core Curriculum, the IST Strategic Sector, and the IST Capstone Experience. The IST Core Curriculum consists of IST Connections I and II, IST Analytical Methods II and III, IST Introduction to Programming and IST Instrumentation. The IST Strategic Sector consists of 300 and 400 level courses that provide content integration, problem solving strategies, and project management skills in the academic major of participating students. The IST Capstone Experience consists of completion of a required course IST capstone course (Senior Project I) and the completion of one of three options: IST Senior Project II¸ IST Internship, or a 6 hour course sequence that enriches the experience of the strategic section experience. During discussions within the IST Department and between IST Faculty and Staff and members of the University Assessment Committee, it was determined that the most effective assessment of these degree programs would involve those factors that have defined the unique elements of IST teaching and learning and have contributed to the success of our graduates. Consequently, the initial assessments were designed to measure the effectiveness of the IST Core Curriculum and the IST Capstone experience.

Assessment of the IST Core Curriculum
Description: Because the IST Core Curriculum focuses on specific technological content (e.g. computer programming, sensor design and operation, and PC integration) and the application of quantitative skills (algebra, trigonometry, and calculus), a multiple choice exam focused on specific content was chosen as the assessment tool. The examination process consists of pre- and post-Core learning experience exams. The pre-Core exam is given to all incoming freshmen and transfer students at the beginning of their first semester in residence. The post-Core exam is administered upon the completion of all Core courses, which is typically at the end of the 4th semester. The completion of the post-Core exam is a prerequisite for enrollment in IST 230 a required course for all IST and ES students. (A copy of the pre- and post-core learning experience exams will be provided in hard copy).
Progress: The initial version of the pre-Core exam was administered electronically to over 40 freshmen and transfer students at the start of the Fall 2009 semester. The post-Core exam will be completed by these students in approximately 2 years upon the completion of the Core course sequence. The content and form of the post-Core examination was discussed extensively during the 2009 IST Summer Retreat and is presently under development. The pre-Core exam is appended to this submission.
Assessment of the IST Senior Project Experience

Description: All IST and ES students are required to complete IST 490, Senior Project I. After extensive review during the 2009 IST Summer Retreat, the course was revised and strategically integrated into the departmental assessment plan. Class activities now require that each student prepare a project plan and proposal and development a professional portfolio. The project plan and proposal scheme follow standard format and include: Introduction, Objective, Scope of Work, Deliverables, Benchmarks, Stakeholders, and Timeline. All students are required to complete the planning document for their proposed project, an outline and timeline for the project, a summary document of the work, and the work as a PowerPoint presentation. As a course requirement, the work is presented to faculty and students on IST Presentation Day, occurring at the end of each semester. Assessment is based on faculty evaluation of five performance rubrics: integration of content knowledge, ability to relate content knowledge to an issue, ability to design an experiment of project around this issue, ability to interpret results and construct a conclusion, and the use of higher order and creative thinking skills in this process. The "Scientific and Critical Thinking Rubrics for 09" assessment is appended to this submission.

Future additions to IST and ES Assessment

All students in IST 490 are presently developing a professional portfolio as a course requirement. This portfolio includes a resume, a technical resume, a sample of professional writing, and a sample cover letter for application for either admission to post graduate education or employment. We are presently developing rubrics that could be used to assess the quality of content in these portfolios and their usefulness to students.

Marshall University

Assessment of Program's Student Learning Outcomes for the Integrated Science and Technology and undergraduate Environmental Science Programs

2009/10

Not every student learning outcome must be assessed every year. However, it is expected that at least one-fourth of the outcomes will be assessed each year, allowing for assessment of all outcomes within a four-year cycle. It also is important to use more than one assessment measure for each outcome.

Program's Student Learning Outcomes	Year evaluated	Assessment Measures (Tools)	Benchmarks	Results	Analysis/ Planned Actions
Given a real world problem, students will be able to choose the most appropriate hardware and software technology to solve the problem. Students will be able to analyze the potential consequences of the hardware and software technology choices they have made to solve problems.	2009 /10	Multiple choice tests administered pre and post completion of the IST Core Curriculum. This test consists of problems that allow students to make reasoned choices.	Mean scores exceed 70% correct answers on the posttest.	Pretest administered to 47 IST and ES freshmen and transfers Fall of 09	Test results presently being analyzed
Students will be able to plan and execute a project (individualized toward their career goals) at a professional level using discipline-specific knowledge.	2009 /10	A faculty assessment of student performance in the two tiers of IST capstone. Scoring rubric is attached.	Mean performance across students will be 3.5 (on 4-point scale) on standard 1 of scoring rubric (attached)	Students presently enrolled in Senior Project I, IST 490 are following the rubrics for project development, consistent with this assessment	

Program's Student Learning Outcomes	Year evaluated	Assessment Measures (Tools)	Benchmarks	Results	Analysis/ Planned Actions
In the development of their project (individualized toward their career goals), students will be able to clearly identify an issue and relate the goals and objectives of the project to this issue.	2009 /10	A faculty assessment of student performance in the two tiers of IST capstone Scoring rubric is attached.	Mean performance across students will be 3.5 (on 4-point scale) on standard 2 of scoring rubric (attached)	Students presently enrolled in Senior Project I, IST 490 are following the rubrics for project development, consistent with this assessment	
In the development of their project (individualized toward their career goals), students will design an experiment or project employing the appropriate scientific or technical methods.	2009 /10	A faculty assessment of student performance in the two tiers of IST capstone Scoring rubric is attached.	Mean performance across students will be 3.5 (on 4-point scale) on standard 3 of scoring rubric (attached)	Students presently enrolled in Senior Project I, IST 490 are following the rubrics for project development, consistent with this assessment	

Program's Student Learning Outcomes	Year evaluated	Assessment Measures (Tools)	Benchmarks	Results	Analysis/ Planned Actions
In the development of their project, students will analyze data in appropriate tabular and numeric form.	2009 /10	A faculty assessment of student performance in the two tiers of IST capstone Scoring rubric is attached.	Mean performance across students will be 3.5 (on 4-point scale) on standard 4 of scoring rubric (attached)	Students presently enrolled in Senior Project I, IST 490 are following the rubrics for project development, consistent with this assessment	

Program's Student Learning Outcomes	Year evaluated	Assessment Measures (Tools)	Benchmarks	Results	Analysis/ Planned Actions
In the development and presentation of their projects (individualized toward their career goals), students will show originality in both the development of purpose for the work and creativity in the design of the methods for the work.	2009 /10	A faculty assessment of student performance in the two tiers of IST capstone	For a majority of students work is judged to be original and both the purpose of the work and the methods used to fulfill are highly creative and original to the student(s) producing the work . Mean performance across students will be 3.5 (on 4-point scale) on standard 5 of scoring rubric (attached)	Students presently enrolled in Senior Project I, IST 490 are following the rubrics for project development, consistent with this assessment	

Scientific and Critical Thinking Domain
Standards and Rubrics

This Assessment is applicable to student projects submitted for credit in IST 490 Senior Project I and IST 491 Senior Project II. All IST and ES undergraduate students are required to complete IST 490. IST 491 is one of three options used by IST students as specified by IST Department to complete the departmental requirement for Capstone. Assessment is expressed as mean score submitted by participating faculty. Faculty qualified for assessment must be full time faculty within the COS and must review all documents submitted by the students as specified by departmental standards and attend the student's final presentation of the work.

Standard # 1: Capacity of student(s) to demonstrate discipline-specific content knowledge.

1. Does not posses any measureable content knowledge.
2. Has some, but incomplete and inaccurate, understanding of content knowledge.
3. Has significant understanding of content knowledge.
4. Displays a full understanding of content knowledge.

Standard # 2: Assessment of ability to clearly identify an issue and relate the goals and objectives of the project to this issue.

1. Issue not clearly defined. Purpose of work and Has limited use of scientific vocabulary. There are major flaws in understanding and interpretation.
2. Uses appropriate vocabulary, but presents only partial understanding of the problem and has minor flaws in the interpretation.
3. Uses appropriate scientific vocabulary, shows complete understanding of a discussed scientific issue, and correctly identifies the conclusions.

Standard # 3: Assessment of ability to design an experiment or project employing the appropriate scientific or technical methods:

1. Conceptual flaws in the design of the experiment.
2. Work contains a design of the experiment with logical procedural problems.
3. Work contains a complete and correct design of the experiment.

Standard # 4: Assessment of ability to analyze data and present data in appropriate tabular and numeric form.

1. No evidence of data analysis.
2. Major flaws in the analysis of the data; data is not clearly connected to stated purpose or hypothesis
3. Analysis of the data is present with minor flaws; data is adequate but it's analysis and use is not
4. Data is clearly presented and subjected to appropriate statistical tests where appropriate. Data "proves the point" of the work and is connected to the hypothesis or stated purpose.

Standard # 5: Extent to which student work shows originality in both development of purpose for the work and creativity in the design of the methods for the work.

1. Objectives of the work and the methods used are relatively mundane and repetitive to the work of others
2. Work shows some originality but clearly follows the purpose of methods of others .
3. Work shows some original thought and some of the purposes and methods are unique to the study and clearly the creation of the student(s) producing the work
4. Work is original and both the purpose of the work and the methods used to fulfill are highly creative and original to the student(s) producing the work.