The Bioengineering Program Outcomes are as follows:

Bioengineering Program Outcomes

Students by the time of graduation will have attained:

a) an ability to apply knowledge of advanced mathematics (including differential equations and statistics), science (including biology and physiology), and engineering to solve problems, especially those at the interface of engineering and biology;
b) an ability to design and conduct experiments, as well as to make measurements on and to analyze and interpret data from living systems, addressing the problems associated with the interaction between living and non-living materials and systems;
c) an ability to design a system, component, or processes to meet desired bioengineering needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, regulatory, manufacturability, and sustainability;
d) an ability to function on and assume leadership roles in diverse, multi-disciplinary teams;
e) an ability to identify, formulate, and solve bioengineering problems;
f) an understanding of professional and ethical responsibility;
g) an ability to communicate effectively, especially in an interdisciplinary environment;
h) the broad education necessary to understand the impact of engineering solutions in a rapidly changing global, economic, environmental, and societal context;
i) a recognition of the need for, and an ability to engage in life-long learning;
j) a knowledge of contemporary issues, especially those impacting Southwest Florida;
k) an ability to use the techniques, skills, and modern engineering tools necessary for bioengineering practice;
l) an understanding of entrepreneurship and business plans; and
m) an ability to define a community problem and to use an engineering design process to deliver a solution.

Table 3-1 details how our Program Outcomes ‘a through k’ (above) map to and encompass ABET Criterion 3 ‘a through k’ outcomes as well as the ABET program specific outcomes of Criterion 9 (which we have defined for convenience as ABET outcomes 9i, ii, iii, iv). Note that our Program Outcomes l and m are supportive only of our Program Educational Objectives (see next section) and so are not included in Table 3-1.

Original of 2008

Table 3-1: Bioengineering Program Outcomes Versus ABET Criteria 3 and 9

ABET Criteria 3 and 9	3a. ability to apply knowledge of mathematics, science, and engineering	3b. an ability to design and conduct experiments, as well as to analyze and interpret data	3c. an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability	3d. an ability to function on multidisciplinary teams	3e. an ability to identify, formulate, and solve engineering problems	3f. an understanding of professional and ethical responsibility	3g. an ability to communicate effectively	3h. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context	3i. a recognition of the need for, and an ability to engage in life-long learning	3j. a knowledge of contemporary issues	3k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	9i. breadth and depth across a range of Bioengineering topics	9ii. understanding of biology and physiology	9iii. capability to apply advanced mathematics (including differential equations and statistics), science, and engineering to solve the problems at the interface of engineering and biology	9iv. the ability to make measurements on and interpret data from living systems, addressing the problems associated with the interaction between living and non-living materials and systems.
Bioengineering Program Outcomes (a through k)															
a. an ability to apply knowledge of advanced mathematics (including differential equations and statistics), science (including biology and physiology), and engineering to solve problems, especially those at the interface of engineering and biology	X											X	X	X	
b. an ability to design and conduct experiments, as well as to make measurements on and to analyze and interpret data from living systems, addressing the problems associated with the interaction between living and non-living materials and systems		X										X			X
c. an ability to design a system, component, or processes to meet desired bioengineering needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, regulatory, manufacturability, and sustainability			X									X			
d. an ability to function on and assume leadership roles in diverse, multi-disciplinary teams				X											
e. an ability to identify, formulate, and solve bioengineering problems					X							X			
f. an understanding of professional and ethical responsibility						X									
g. an ability to communicate effectively, especially in an interdisciplinary environment							X								
h. the broad education necessary to understand the impact of engineering solutions in a rapidly changing global, economic, environmental, and societal context								X							
i. a recognition of the need for, and an ability to engage in life-long learning									X						
j. a knowledge of contemporary issues, especially those impacting Southwest Florida										X					
k. an ability to use the techniques, skills, and modern engineering tools necessary for bioengineering practice											X	X			

C. Relationship of Program Outcomes to Program Educational Objectives

Our Program Outcomes foster achievement of our Program Educational Objectives by ensuring that we provide students with the appropriate knowledge, abilities, experiences, and skills as they progress through the Bioengineering undergraduate experience towards their graduation. Table 3-2 conveys the correspondence between our Program Outcomes and Program Educational Objectives – demonstrating that all four objectives are well supported by our outcomes.

D. Relationship of Courses in the Curriculum to the Program Outcomes

Table 3-3 has been developed to illustrate the relationship between courses (and course content) in our curriculum and the Program Outcomes. As can be seen, 'X' entries in this Table correspond to courses which have learning outcomes that are in direct and significant support of student attainment of Program Outcomes. Entries with an 'X' as well as shading (YELLOW for interdisciplinary engineering courses; ORANGE for Bioengineering courses) denote courses where 'targeted' assessment and evaluation tasks have been assigned to the faculty in the last two years in order to measure the degree to which Program Outcomes are being attained (for more details see Self-Study section 3.F, "Achievement of Program Outcomes"). The curriculum was developed to provide students with multiple opportunities to be exposed to learning experiences that contribute towards attainment of any given Program Outcome, especially as they near the completion of their educational experience in our program. Drop-down comments in the Excel spreadsheet of Table 3-3 as used by the faculty indicate specific elements of a given PO and for a specific assessment assignment [e.g. a focus on use of differential equations under PO 'a', or a focus on ethical responsibility under PO 'f').

E. Documentation

Binders with samples of student work organized by our Program Outcomes will be available during the ABET review visit. These "Outcomes" binders will also contain updated PO assessment, evaluation, and results summaries beyond those in this self-study report. Syllabi and, where available, additional descriptive materials (e.g. textbooks, course learning outcomes, etc.) for courses in the major that are taught outside of the WSOE (e.g. math and sciences, including biology) will also be available for ABET visitors to consult and review. Course binders, which will contain explanatory information on each course (e.g. course syllabi including learning outcomes, end-of-semester Course Assessment Reports prepared by the faculty, important teaching materials, etc.) as well as samples of student work that are most pertinent to the course learning outcomes, and textbooks will be available to the evaluation team. A Program Surveys binder (containing AY2008-09 Written and One-On-One Senior Exit Surveys with results, as well as Senior Project Mentor Surveys with results) will also be available. Student portfolios from our BME 4800C Bioengineering Product Design course as well as both the senior design experience courses will also be available.

Table 3-2: Bioengineering Program Outcomes Versus Program Educational Objectives

Original of 2008 updated 1/09

Bioengineering Program Educational Objectives (I through iv)	i. Graduates are technically competent bioengineers…	… enabled to be leaders…	… and/or valued contributors in their professions…	… and communities.	ii. Graduates make use of the necessary attributes, learning skills,…	… and entrepreneurial/business outlook…	… to successfully adapt to and remain competitive in a changing global society and technological world.	iii. Graduates are accomplished at communicating …	… and working collaboratively…	… as professionals …	… in a diverse, interdisciplinary environment.	iv. Graduates • successfully enter chosen careers in the medical device, health care, or biotechnology fields, and/or graduate studies or professional training.
Bioengineering Program Outcomes (a through m)												
a. an ability to apply knowledge of advanced mathematics (including differential equations and statistics), science (including biology and physiology), and engineering to solve problems, especially those at the interface of engineering and biology	X											X
b. an ability to design and conduct experiments, as well as to make measurements on and to analyze and interpret data from living systems, addressing the problems associated with the interaction between living and non-living materials and systems	X											X
c. an ability to design a system, component, or processes to meet desired bioengineering needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, regulatory, manufacturability, and sustainability	X						X					X
d. an ability to function on and assume leadership roles in diverse, multi-disciplinary teams		X							X		X	X
e. an ability to identify, formulate, and solve bioengineering problems	X											X
f. an understanding of professional and ethical responsibility			X							X		X
g. an ability to communicate effectively, especially in an interdisciplinary environment								X	X		X	X
h. the broad education necessary to understand the impact of engineering solutions in a rapidly changing global, economic, environmental, and societal context							X					X
i. a recognition of the need for, and an ability to engage in life-long learning					X							X
j. a knowledge of contemporary issues, especially those impacting Southwest Florida							X					X
k. an ability to use the techniques, skills, and modern engineering tools necessary for bioengineering practice	X											X
l. an understanding of entrepreneurship and business plans						X						X
m. an ability to define a community problem and to use an engineering design process to deliver a solution	X			X								X

Table 3-3 Bioengineering Required Courses Articulation Matrix

	Courses	Humanities and Social Sciences Electives	HUM2510 Understanding Visual and Performing Arts	ENC 1101 and 1102 English Composition I and II	IDS3920 University Colloquium	MAC2311 Calculus I	MAC2312 Calculus II	MAC2313 Calculus III	MAP2302 Differential Equations	STA 2037 Statistics with Calculus	CHM1045C General Chemistry with Lab I	CHM1046C General Chemistry with Lab II	CHM2210 Organic Chemistry with Lab I	CHM2211 Organic Chemistry with Lab II or Technical Elective	PHY2048C General Physics I	PHY2049C General Physics II	BSC1010C General Biology with Lab I	EGN1006L Intro to Engineering Professions	EGN1041C Problem Solving & Design Engrs	EGN3420C Engineering Mechanics	EGN3331C Mechanics of Materials	EGN3641C Engineering Entrepreneurship	BME3100C Introduction to Biomaterials	BME3403C Human Physiology for Engineers I	EGN3373C Circuits and Sensors for Bioengineers	EGN3833C Service Learning in Engineering	BME3404C Human Physiology for Engineers II	EGN3374C Signals and Systems for Bioengineers	BME4800C Bioengineering Product Design	BME3261C Biofluid Mechanics	EGN4410L Engr Senior Design I	EGN 4632C Biotransport Phenomena	EGN4503C Biomedical Instrumentation	EGN4211C Biomechanics	EGN4411C Engr Senior Design II	EGN4504C Bioelectricity	EGN4722C Health Care Engineering	Technical Elective	sumof all semester credit hours across curriculum
	credit hours	12	3	6	3	4	4	4	3	3	4	4	4	4	4	4	4	1	2	4	3	3	3	3	3	2	3	3	3	3	1	3	3	3	3	3	3	4	129
Bioengineering Program Outcomes																																							
a	an ability to apply knowledge of advanced mathematics (including differential equations and statistics), science (including biology and physiology), and engineering to solve problems, especially those at the interface of engineering and biology					X	X	X	X	X	X	X	X		X	X	X	X	X	X	X		X	X	X		X	X	X	X	X	X	X	X	X	X	X		
b	an ability to design and conduct experiments, as well as to make measurements on and to analyze and interpret data from living systems, addressing the problems associated with the interaction between living and non-living materials and systems									X									X		X		X	X	X		X	X	X	X	X	X	X	X	X	X	X		
c	an ability to design a system, component, or processes to meet desired bioengineering needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, regulatory, manufacturability, and sustainability																	X	X		X	X	X	X	X	X		X	X		X	X	X	X	X				
d	an ability to function on and assume leadership roles in diverse, multidisciplinary teams																	X	X		X	X		X		X			X		X				X				
e	an ability to identify, formulate, and solve bioengineering problems																	X		X	X		X	X	X		X	X	X	X	X	X	X	X	X	X	X		
f	an understanding of professional and ethical responsibility																	X				X	X	X		X	X		X		X		X	X	X	X	X		
g	an ability to communicate effectively, especially in an interdisciplinary environment	X		X	X													X	X	X	X	X	X	X		X	X	X	X		X		X		X		X		
h	the broad education necessary to understand the impact of engineering solutions in a rapidly changing global, economic, environmental, and societal context	X	X		X													X				X				X			X		X				X		X		
i	a recognition of the need for, and an ability to engage in life-long learning																	X	X				X	X			X		X		X		X		X		X		
j	a knowledge of contemporary issues, especially those impacting Southwest Florida	X			X													X				X	X	X		X	X		X		X		X		X		X		
k	an ability to use the techniques, skills, and modern engineering tools necessary for bioengineering practice																	X		X			X	X	X		X	X	X	X	X	X	X	X	X	X	X		
l	an understanding of entrepreneurship and business plans																					X				X			X		X				X				
m	an ability to define a community problem and to use an engineering design process to deliver a solution																						X			X											X		

F. Achievement of Program Outcomes

Assessment and Evaluation Processes That Periodically Document and Demonstrate the Degree to Which the Program Outcomes Are Attained

"Targeted" Course Assessments for Program Outcomes Assessment and Evaluation

At the August 2007 faculty Academic Retreat, the faculty agreed to make use of the information in Table 3-3 to establish a "targeted course assessment" process whereby faculty members will receive annual assignments to carry out detailed assessments in given junior and senior year courses in our curriculum with the goal of carrying out direct (quantitative) assessments of the extent of student achievement of specific course learning outcomes, each of which are then linked to given Program Outcomes (or, in some cases, specific elements of a given Program Outcome). The faculty are responsible for identifying and assessing specific items of student work which clearly map to a specific Program Outcome. In their end-of-semester Course Reports (see also Criterion 6 section B of this report), faculty are responsible for summarizing the results of these targeted assessments for each course, which are then reported to the combined faculty at the next Academic Retreat. (Fall course assessments are deliberated upon by the faculty in the following May retreat, and Spring course assessments are considered in the next August retreat.) This timing has been established so that the faculty have sufficient time to carry out their assessments and evaluations before they are brought to the full faculty for discussion and drawing of conclusions. In May 2009, assessments from Fall 2008 and Spring 2009[18] were considered on an accelerated schedule in order to have a complete two-year cycle of Program Outcomes assessment for this self-study report.[19]

At the May 2008 Academic Retreat, the Bioengineering faculty established target metrics for quantitative assessment of any given Program Outcome using targeted assessments of student work. The following applies for an outcome to be achieved:

- For Junior Level Courses – At least:
    - 40% of the students will achieve an 85% or higher (highly competent on our rubric scale)
    - 70% will achieve a 70% or higher (competent on our rubric scale)
    - 80% will achieve a 65% or higher (minimally competent on our rubric scale)
- For Senior Level Courses – At least:
    - 45% of the students will achieve an 85% or higher (highly competent on our rubric scale)
    - 75% will achieve a 70% or higher (competent on our rubric scale)
    - 90% will achieve a 65% or higher (minimally competent on our rubric scale)

At the August 2008 Academic Retreat, the faculty further agreed that in order for a given targeted assessment to be considered as indicating 'competence,' students in the course must

[18] Some of these were in preliminary form and will be considered in final form at our August 2009 retreat.
[19] At the May 2009 retreat, the faculty discussed and began moving towards streamlining the Targeted Course Assessment processes to ensure that we have in place a meaningful but sustainable system over time.

have also demonstrated at least 'minimal competence' for the same assessment; likewise, to be able to conclude that the students have achieved a level of 'high competence,' they must have also, collectively, met the metric for 'competence.' As a working policy at this point, where multiple targeted assessments of student work in a given course and for support of a given Program Outcome have been carried out, at least ~70% of the assessments must meet the given metric level in order for it to be met (and where only three assessments have been carried out at least two or 67% must meet the metric).

For purposes of periodic assessment and evaluation of levels of student achievement of our Program Outcomes, our process goal is to have all targeted assessments under each PO indicating that students are at least 'minimally competent' and preferably 'competent' or better.

As an example, consider a targeted assessment of student work from Dr. Geiger's Spring 2008 offering of BME 3261C Biofluid Mechanics. For his course Learning Outcome #3 (Ability to formulate and solve problems in hydrostatics (including topics such as manometers, forces on container walls, buoyancy, etc.), Dr. Geiger identified two exam problems and one laboratory exercise which clearly mapped to this Learning Outcome. In turn, this Course Learning Outcome #3 was considered by Dr. Geiger to support student achievement of our Program Outcome "e" (an ability to identify, formulate, and solve bioengineering problems) as a clear performance indicator. The table below from Dr. Geiger's Course Report summarizes assessment and evaluation results for this targeted assessment.

Assessment tool / Learning Outcome	Question 1, Exam 1 Question 3, Exam 1 Laboratory 1	Results
3. Formulate and solve problems in hydrostatics (including topics such as manometers, forces on container walls, buoyancy, etc.).	Highly Competent: 40% of the students achieve at least a 85	Question 1 – 0 of 5 (0%) Question 3 – 0 of 5 (0%) Lab 1 – 3 of 5 (60%)
	Competent: 70% of the students score achieve at least a 70	Question 1 – 5 of 5 (100%) Question 3 – 5 of 5 (100%) Lab 1 – 4 of 5 (80%)
	Minimally Competent: 80% of the students achieve at least a 65	Question 1 – 5 of 5 (100%) Question 3 – 5 of 5 (100%) Lab 1 – 4 of 5 (80%)
Action Taken	None – class is meeting expectations for this outcome.	

Additional Assessment and Evaluation Processes

Additional assessment processes are in place to provide annual measures for evaluation of levels of student achievement of our Program Outcomes. These include:

- Written Senior Exit Survey – some survey questions linked to both direct and indirect measures related to specific elements of our POs.
- Senior Project Mentor Survey – survey of mentors of senior project experiences of graduating students; Criterion 3 questions targeted towards measurement of mentors' assessment of levels of student achievement of our POs.
- Performance on the Fundamentals of Engineering (FE) Examination – all graduates are encouraged to study for and take the FE examination as a step towards eventual professional licensure. 75% of our initial graduating class (3 of 4) applied for and took the FE exam in April 2009.[20] FE examination results (especially sub-scores) will be used as indicators of specific PO achievement (especially elements of our PO 'a' specific to math and the sciences, including biology; also as an indicator for our PO 'e'). We will evaluate performance of our students on FE sub-scores in comparison to national norms.[21]
- Judging of Engineering Senior Design II Final Poster Presentation – course faculty, additional faculty, and industry guest judging of final senior design poster presentations; sub-scores used as direct measures related to specific elements of pertinent POs.

Level of Achievement of Each Program Outcome

Targeted Course Assessments for AY2007-08 and AY2008-09

Table 3-4 describes 'targeted' course assessment results to date (over the last two academic years). Check marks (✓) in the table indicate assessments that have been reported to the faculty at Academic Retreats and have been evaluated as indicating an overall level of student achievement in support of a given PO as 'competent' or better. As in Table 3-1, 'X' entries in this table correspond to additional courses which also have learning outcomes that are in direct and significant support of student attainment of Program Outcomes. YELLOW shading indicates interdisciplinary engineering courses and ORANGE Bioengineering courses. Most junior level course assessments have been carried out twice to date (two entries per cell) while senior level course assessments have been carried out once (one entry per cell). To date, no overall 'targeted' assessment has indicated that levels of student achievement in support of a PO were at our rubric levels of 'not competent.'

[20] In addition, one student scheduled to graduate in Summer 2009 also took the FE in April 2009.
[21] In late June 2009, all four Bioengineering students who took the FE exam in April, 2009 have reported that they passed the exam.

We conclude, based on these direct measures of student achievement of our Program Outcomes (and specific elements of POs), that students in our program are demonstrating competency or better across all of our outcomes, i.e. that all of our Program Outcomes and ABET's outcomes 3 'a' through 'k' have been achieved.

Table 3-4. “Targeted’ Course Assessments for AY2007-08 and AY 2008-09

	Courses	EGN3641C Engineering Entrepreneurship	BME3100C Introduction to Biomaterials	BME3403C Human Physiology for Engineers I	EGN3373C Circuits and Sensors for Bioengineers	EGN3833C Service Learning in Engineering	BME3404C Human Physiology for Engineers II	EGN3374C Signals and Systems for Bioengineers	BME4800C Bioengineering Product Design	BME3261C Biofluid Mechanics	EGN4410L Engr Senior Design I	EGN4632C Biotransport Phenomena	EGN4503C Biomedical Instrumentation	EGN4211C Biomechanics	EGN4411C Engr Senior Design II	EGN4504C Bioelectricity	EGN4722C Health Care Engineering
Bioengineering Program Outcomes																	
a	an ability to apply knowledge of advanced mathematics (including differential equations and statistics), science (including biology and physiology), and engineering to solve problems, especially those at the interface of engineering and biology		√√	√√	√√		√√	√√	x	√√	x	√	x	√	√	√	√
b	an ability to design and conduct experiments, as well as to make measurements on and to analyze and interpret data from living systems, addressing the problems associated with the interaction between living and non-living materials and systems		√√	x	x		√√	√√	x	x	x	x	√	√	x	√	x
c	an ability to design a system, component, or processes to meet desired bioengineering needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, regulatory, manufacturability, and sustainability	x	x	x	x	x		x	√√		√	x	√	x	√		
d	an ability to function on and assume leadership roles in diverse, multidisciplinary teams	√		x		√			x		√				√		
e	an ability to identify, formulate, and solve bioengineering problems		x	x	x		x	√	√√	√√	√	√	x	√	√	√	x
f	an understanding of professional and ethical responsibility	x	√	x		x	√		√√		√		x	√	√	x	x
g	an ability to communicate effectively, especially in an interdisciplinary environment	√	x	x		√	x	x	√		x		√		√		√
h	the broad education necessary to understand the impact of engineering solutions in a rapidly changing global, economic, environmental, and societal context	x				√			x		√				x		√
i	a recognition of the need for, and an ability to engage in life-long learning		√√	x			x		√		√		x		√		x
j	a knowledge of contemporary issues, especially those impacting Southwest Florida	x	√√	x		x	x		√		x		x		√		√
k	an ability to use the techniques, skills, and modern engineering tools necessary for bioengineering practice		x	√√	√		x	x	x	x	x	x	x	√	√	x	x
l	an understanding of entrepreneurship and business plans	√√				x			x		x				√		
m	an ability to define a community problem and to use an engineering design process to deliver a solution		x			√√											√

Table 4-1. Actions Taken to Improve the B.S. in Bioengineering

Criterion 1. Students			
Basis for Action	Action Taken	Action Implemented	Results To Date of Implementation
Faculty and advising staff recognition in AY2006-07 that course and career advising/mentoring could benefit from regularly scheduled group events for students	Scheduling of 'drop by' course registration & mentoring events each semester	First event held in Spring 2007 (for registration for Fall 2007 courses); held each semester since that time	Events are popular and successful as an alternative to having students schedule individual appointments, especially for course registration.
Identified need at the University level for on-line degree evaluation system accessible by students, advisors, and faculty	Creation of on-line Curriculum, Advising & Program Planning (CAPP) system	First brought on-line in AY2008-09	In AY2008-09 being used by the WSOE Academic Advisor on a trial basis; will be up and fully operational for students following the AY2009-10 catalog
2007 Advisory Board recommendation to plan for growth in the WSOE with recognition by the WSOE leadership that increased student body quality should promote short-term enrollment(s) management	Fall 2008 recommendation for increased engineering admissions standards formulated by WSOE Recruitment and Retention Committee; brought to WSOE Curriculum Committee; and then submitted to the University Curriculum Team	New standards have been approved by UCT in Spring 2008 for implementation in AY2009-10	Students following the AY2009-10 catalog now subject to new admissions standards

Criterion 2. Program Educational Objectives			
Basis for Action	Action Taken	Action Implemented	Results To Date of Implementation
2007 Advisory Board recommendation to ensure that graduating seniors are eligible to take the FE exam under Florida regulations; and faculty recognition of importance that graduates are well prepared to pass the exam	Dr. O'Neill (Chair, Dept. Environmental and Civil Engineering) worked with state authorities to ensure that first graduates could sit for the FE in Spring 2009; WSOE faculty (including Bioengineering) enlisted to teach FE review course (non-credit)	Request to hold the FE exam at FGCU in April, 2009 for first graduates was approved; faculty taught FE review course in Spring 2009	FE exam was held on FGCU campus April 25, 2009 for first program graduates
2008 Advisory Board recommendation to seek more industry partners in Bioengineering, including outside SW FL, and to link effort to job-seeking needs of graduates	Dr. Sweeney is active member of initial Organizing Committee of the new SW FL Chapter of BioFlorida (www.bioflorida.com), a state-wide organization founded to advance Florida's bioscience industries, including medical technologies.	BioFlorida events and activities, including networking with industry representatives, are open to FGCU Bioengineering students; first open event of the new SE FL Chapter was on 2/10/09 near campus; BMES Student Chapter members from FGCU assisted in running the event.	Results of this action will continue to be seen in the near future as Bioengineering students interface with BioFlorida members. Mr. Bill Knab, founding Chair of the SW Fl Chapter of BioFlorida, has also interacted with students in our program in classes, etc.

<table>
<tr><th colspan="4">Criterion 3. Program Outcomes and Criterion 9. Program Criteria (integrated together)</th></tr>
<tr><td>Basis for Action</td><td>Action Taken</td><td>Action Implemented</td><td>Results To Date of Implementation</td></tr>
<tr><td>Course Reports for EGN 1041C and EGN 3374C from AY2007-08 indicated that students' degree of achievement of programming skills using MATLAB were less than desired (with potential impact on overall levels of student achievement of Program Outcome k)</td><td>Bioengineering faculty discussions at Academic Retreats of 5/08 and 8/08 yielded decision to have Dr. Torres increase content delivery of MATLAB using problems pertinent to Signals and Systems in his Spring 2009 offering of EGN 3374C.

WSOE faculty discussions at Academic Retreat of 5/09 yielded decision to increase MATLAB based structured programming content within EGN 1041C starting in Fall 2009</td><td>EGN 3374C now being taught since Spring 2009 with increased emphasis on building students' skills in using MATLAB

EGN 1041C will be taught starting in Fall 2009 with increased MATLAB and structured programming content</td><td>While more MATLAB content was introduced into EGN 3374C in Spring 2009, it remained clear that a more in-depth introduction to MATLAB-based programming in EGN 1041C would still be of benefit.

Results of this change will be forthcoming in AY2009-10</td></tr>
<tr><td>Identified need to ensure that use of statistics in solving Bioengineering problems and in data analysis/experimental design is emphasized within upper-division Bioengineering courses (pertinent to Program Outcomes a and b) based on Course Reports and discussion at 8/09 Academic Retreat</td><td>Faculty agreed to emphasize
• DOE & hypothesis testing in Fall 2008 offering of BME 4211C Biomechanics,
• And in Spring 2009 offering of BME 3404C Human Physiology for Engineers II,
• Applied statistics in BME 4722C Health Care Engineering, and also in BME 3404C, both in Spring 2009</td><td>Fall 2008 offering of BME 4211C made this implementation; Spring 2009 offerings of BME 3404C and BME 4722C made this implementation</td><td>AY2008-09 course assessments from Biomechanics and Physiology for Engineers II indicate improvements in delivery and learning in this area; the Spring 2009 course assessment from BME 4722C indicated clear success in reinforcement of students' learning to apply statistical methods in their discipline</td></tr>
</table>

Criterion 5. Curriculum			
Basis for Action	Action Taken	Action Implemented	Results To Date of Implementation
Advisory Board recommendation (11/05) to try to create more room for technical electives in the original curriculum and in order to deliver engineering statics and dynamics in a more condensed fashion	WSOE Curriculum Committee formulated revisions to the curriculum whereby engineering statics and dynamics would be taught within one 4 hr course (became EGM 3420C); and the originally planned course EGN 4XXX Analysis of Design in Bioengineering (which became BME 4800C) was reduced from 4 hrs to 3; both actions in order to add a 3 hr technical elective to the Bioengineering curriculum	These actions (see WSOE Curriculum Committee minutes of 11/18/05 and 4/18/06) were implemented for the AY2006-07 curriculum.	Students have freedom to make use of this technical elective in fulfilling their degree requirements.
Student and faculty input that EGN 3833C Engineering Service Learning and EGN 3641C Engineering Entrepreneurship might be more effective delivered in the opposite order and at the junior level of the curriculum (input from first offerings of these courses in Spring 2006 and Fall 2007)	WSOE Curriculum Committee discussed this possible improvement on 3/28/07 and then approved the needed curriculum changes on 10/10/07.	This curricular change was implemented for students entering on catalog years of AY2006-07 and onwards.	The revised sequence has now been offered in AY2008-09 for the first time (because the sequence was elevated to the junior level of the curriculum; seniors in AY2008-09 passed through the old version of the sequence). AY2008-09 assessment results indicate that students in both courses have shown competency or better for course outcomes; with more course and assessment improvements planned for AY2009-10.

Criterion 5. Curriculum (continued)			
Basis for Action	Basis for Action	Basis for Action	Basis for Action
Recognition by faculty following Fall 2006 that CAD component in EGN1008C Engineering Concepts and Methods could be deleted (given that Civil Engineering and Environmental Engineering majors see AutoCAD in their Computer Graphics course, and Bioengineering majors see SolidWorks in BME 4800C), creating possibility that EGN 1008C could be replaced with a revised 2 credit hr course (instead of 3)	EGN 1008C was replaced in the curriculum with the 2 credit hr course EGN 1041C Problem Solving and Design for Engineers (originally taught as EGN 4930); enabling more design to be taught at the freshman level and freeing up 1 credit hr for an additional hr of technical elective (see above for basis)	Problem Solving and Design for Engineers was taught as EGN 4930 for first time in Spring of 2007; established as EGN 1041C in the AY2008-09 curriculum.	EGN 1041C is effective in promoting the start of the design sequence in Bioengineering; students are effectively learning SolidWorks via BME 4800C based upon course assessments; technical elective in curriculum became 4 hrs instead of 3.
Recognition by faculty that initial curricular requirement of CHM 2211 Organic Chem w/Lab II was inconsistent with national norms, and that replacement of this requirement would open up 4 additional credit hrs for a second technical elective (see Advisory Board recommendation above)	Dr. Blanchard and Dr. Sweeney successfully petitioned state authorities for a change to the state-wide "Common Prerequisites" for Bioengineering and Biomedical Engineering programs in order to have O Chem II removed (still in the final approval stages at the state level)	AY2008-09 curriculum now lists requirement as CHM 2211C Organic Chemistry w/Lab II or Technical Elective	Students have freedom to make use of this additional technical elective in fulfilling their degree requirements.

Criterion 5. Curriculum (continued)			
Basis for Action	Basis for Action	Basis for Action	Basis for Action
Student feedback (via Fall 2008 Student Assessments of Instruction for EGN 4410L Engineering Senior Design I; also confirmed via student feedback in the Spring, 2009 Written and One-On-One Senior Exit Surveys) and faculty recognition that the Engineering Senior Design experience would be better structured not as a multidisciplinary offering (as in AY2008-09 with all engineering majors registering for one section of each class and taught by three instructors [one from each of the three engineering majors, including Bioengineering]) but rather as separate discipline-specific course offerings	The WSOE Leadership team considered this issue in 2/09 and agreed to separate the engineering majors for AY2009-10 into three separate sections of Engineering Senior Design I and II (i.e. discipline-specific sections) so that students can receive more distinct senior design experiences. A common time slot will exist each semester where the three separate sections can still come together as desired by the instructors for multidisciplinary design experiences (e.g. guest speakers, design reviews, etc.) but otherwise the students will meet in their separate sections.	This action has been implemented for the coming 2009-10 academic year.	Results to come in AY2009-10.

Criterion 6. Faculty			
Basis for Action	**Action Taken**	**Action Implemented**	**Results To Date of Implementation**
Need to hire adequate number of talented faculty in program with range of appropriate competencies from program inception in 2005 to present	Faculty and WSOE leadership searches were authorized and carried out.	AY2004-05, 2005-06, and 2006-07 searches were approved and were successful	Two administrators (Blanchard and Sweeney) and four faculty (Zidek, Torres, Geiger, Csavina) in place. Faculty cover the breadth of our curriculum via their expertise.

Criterion 7. Facilities			
Basis for Action	Action Taken	Action Implemented	Results To Date of Implementation
Need in AY2007-08 and Fall of 2008 for lecture/lab facility to deliver Bioengineering courses prior to Holmes Hall opening	Dr. Blanchard requested that the university provide LIB (library) room 323 as a dedicated location for equipping and teaching Bioengineering lecture/lab courses	University approved this request and Bioengineering courses were delivered in lecture/lab format in AY2007-08 and Fall of 2008 to first two cohorts of students	First two cohorts of Bioengineering students experienced successful Bioengineering course deliveries (based on Course Reports and assessments) in time period prior to the engineering programs having their own "home"
Need for the engineering programs of the WSOE to have dedicated teaching and research facilities in order to meet full potential	Founding Director and faculty worked since program inception in 2005 along with strong university and community support to design, equip, and occupy Holmes Hall.	Faculty occupied Holmes Hall in 12/08 with first courses delivered for Spring 2009.	Holmes Hall is a state-of-the-art learner-centered environment. First cohort of program graduates in Bioengineering able to utilize facilities in their final semester in curriculum.

Criterion 8. Support			
Basis for Action	Action Taken	Action Implemented	Results To Date of Implementation
Need identified prior to occupying Holmes Hall for support to hire a Lab Manager for the building	Dr. Blanchard requested support for this position from the Provost; this support was approved.	Dr. O'Neill led search in Fall 2008 to fill this position (Dr. Sweeney was on search panel); Mr. Mark Chew was hired.	Mr. Mark Chew started work at FGCU in this position in 1/09.