

**WEDNESDAY, NOVEMBER 16, 2011**

**SUBJECT: APPROVAL OF PROGRAM REVIEW – COLLEGE OF ENGINEERING & COMPUTER SCIENCE**

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**PROPOSED BOARD ACTION**

Approve program review for the following programs:

- a) Computer and Electrical Engineering and Computer Science (CEECS)
- b) Civil, Environmental and Geomatics Engineering (CEGE)
- c) Ocean and Mechanical Engineering (OME)

**BACKGROUND INFORMATION**

Under Florida Board of Governors Regulation 6C-8.015 adopted March 29, 2007, all academic degree programs in the State Universities must be reviewed at least every seven years. Program reviews ensure that academic programs are administered and delivered effectively, efficiently, and consistent with FAU's mission and the Board of Governors' strategic priorities. The results of program reviews are expected to inform strategic planning, program development, and budgeting decisions at the university level, and when appropriate, at the state level.

Academic program review at FAU is composed of three elements:

- Self-study by the program's department
- Review by the Provost
- Presentation of the program review to the Board of Trustees for approval.

Program review includes a description of the mission and purpose of the program, findings, recommendations and major changes from the last program review; the programs' performance in instruction, research, and service; other program goals; identification of strengths and weaknesses, resource needs; and evidence of student learning and program improvement. Program Review Summary reports are provided to the BOG through an electronic standardized template.

**IMPLEMENTATION PLAN/DATE**

Upon BOT approval

**FISCAL IMPLICATIONS**

N/A

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**Supporting Documentation:**

**Presented by: Dr. Brenda J. Claiborne, Provost**

**Executive Summaries**

**Phone: 561-297-3062**

  

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**COLLEGE OF ENGINEERING  
& COMPUTER SCIENCE**  
Florida Atlantic University

**PROGRAM REVIEW  
AND  
DEPARTMENTAL PERFORMANCE REVIEW**

**Prepared by**

**Mohammad Ilyas, Interim Dean**

**August, 2011**

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*The purpose of this review of programs in the College of Engineering and Computer Science is twofold. It is intended to serve (1) as Academic Program Review, as required by the Florida Board of Governors (BoG), and (2) as Departmental Performance Review. This Review is compliant with the policies, guidelines, and procedures of the Florida BoG.*

*According to the FAU Board of Trustees and Florida BoG guidelines and procedures, each academic department prepares a self-study of its programs using its Dashboard Indicators (DDIs). The DDIs provide program performance data for the past three years. The accompanying self-study reports include assessment reports, program goals and outcomes for student learning, research, and service. The reports also include DDIs as Appendices. This review also incorporates findings from recent program accreditation reviews (where applicable) by the Accreditation Board for Engineering and Technology (ABET).*

*The review also includes an assessment by the Dean of the College based on the self-study reports prepared by the academic departments, and the information provided by the DDIs.*

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Performance of the College is inextricably linked with the performance of individual departments and programs. In this section, we present an overview of overall College status, performance, and resources. Academic departments in the College of Engineering and Computer Science were reorganized in 2009 and included merger of departments. Five departments were merged to form three departments. The reorganization resulted in better and more efficient use of the College resources. This information provides context for review of the individual program performance in the sections that follow. The College productivity has a positive trend despite reduction in resources and budget reductions.

**ABET Accreditation Reviews:** Undergraduate programs in the College of Engineering are accredited by the Accreditation Board for Engineering and Technology (ABET). The Computer Science program is accredited by the Computer Accreditation Commission of ABET and the engineering programs are accredited by the Engineering Accreditation Commission.

All programs except our new programs underwent accreditation reviews in Fall 2008 and are accredited to September 2015. Satisfaction with the academic programs, curricula, educational objectives, student learning outcomes, instruction, advising, and student professional development was high. Two of the College programs are new and were not part of the ABET review in 2008. The Bachelor of Geomatics Engineering program will be reviewed in Fall 2011 and the Bachelor of Information Engineering Technology program is not yet scheduled for ABET review at this stage.

**Program Assessment Reports:** Each academic program in the College has a comprehensive set of goals, learning outcomes, and assessment procedures encompassing the principles of continuous quality improvement and supportive of institutional and College missions, goals, and objectives. Student learning at the undergraduate and graduate levels, research, and service are addressed. These efforts support both University assessment requirements and the requirements of ABET. Departmental assessment reports and plans for 2009-2010 all were rated as Adequate or Strong by the FAU Director of Assessment. The new programs do not yet have a full suite of assessment data. The College and the departments continuously work together to improve assessment plans and procedures and to translate outcomes to program improvements. The College places high priority on these efforts, as does our accreditation agency (ABET).

**Enrollment Trends:** Undergraduate enrollments in the College of Engineering mirror national trends. Graduate enrollments closely follow the levels of funding available for graduate student stipends and tuition waivers. The national enrollments in engineering and computer science did see a slow growth in recent years. The DDIs indicate that the College's annual headcount enrollments in 2009-10 totaled 2,211 – 1,815 Undergraduate, and 396 Graduate. From 2007-08 to 2009-2010, the College enrollment has grown by about 13%. This is due to softening of enrollment trends in computer science – a national trend. The impact on enrollments from the steady outsourcing of high technology jobs from the USA is not fully known at this stage. The enrollment growth is expected to become faster as demand for computer technology accelerates. In addition, FAU's focus on eLearning is expected to help the enrollment growth in the College.

**Student Satisfaction:** College results from surveys of Student Perception of Teaching and of Satisfaction with Courses, Instruction, and Advising mirror closely the overall results for the University. The College is known for excellent instruction and for strong student advising practices. Regular faculty members provide instruction for a very high percentage of courses in the College. This is fitting, given the highly specialized nature of engineering and computer science programs.

**Funded Research:** The College of Engineering and Computer Science expects to be a leading contributor toward the University goal of increasing funded research. Our commitment is firm and our programs are uniquely positioned to address research needs of regional, state, and national priority. Among other projects, the College is houses the Southeast National Marine and

Renewable Energy Center (SNMREC), one of three such centers in the nation. The current yearly research expenditure in the College is about \$8M. The recent decline in research expenditure has been due to attrition (relocation and retirements) of some of the very productive faculty members. We are developing a plan for substantially increasing the research funding in our College.

**Creative and Scholarly Activities:** All programs of the College are very actively involved in creative and scholarly activities, including development of courses and curricula, publication of journal and conference articles, authoring of books and book chapters, and presentations of seminars and colloquia. Additional information is provided in DDIs.

**Service:** All departments in the College are strong in terms of service, both for departmental, College, and University governance and for service to business, industry, the community, and the profession. Service to the profession includes items such as review of professional books, journal articles, and research proposals, editorial positions with professional publishers, service with a wide variety of advisory groups and panels, and service as an officer or speaker for professional societies. Additional information is available in available in DDIs.

**Faculty:** Faculty members are the most important resource of the College. While College productivity has been increasing, numbers of faculty have been decreasing. Budget reductions and realignments have required the College to use funds from vacant faculty positions to use for operating funds. For the same reason recent attritions in faculty has not only impacted our funded research but is also placing severe restrictions on our ability to meet our instructional needs. There are very few junior faculty members in the College. A large fraction of current faculty members is rapidly reaching retirement age. Many of the faculty members may retire within a few years and that will pose a serious challenge to delivering the academic mission of the College.

**Staff:** Staff support in the College has declined over the last three years and is inadequate. Technician support for laboratories is an accreditation issue and remains a high priority need. With inadequate staff support, faculty members end up having to do lab setups and equipment maintenance and repairs-a very inefficient use of their time and expertise. In addition, there is a need for adequate academic advising staff.

**Space:** The College moved to a new 97,000 square feet building in Fall 2010. This relocation did provide an additional space of about 30,000 square feet. The space continues to be a challenge. Additional space on the Boca Raton campus is required for the College to grow its research and to provide adequate space for teaching laboratories.

## **DEPARTMENTAL/PROGRAM REVIEWS**

This section provides reviews and overall performance evaluation of each of three departments in the College and the programs therein. These evaluations are based on the performance data from the DDIs and from the Program Assessment Reports. Detailed evaluation reports of all the departments were prepared by the Chairs of the departments and are attached with this review.

The College of Engineering and Computer Science is blessed with highly competent faculty and staff. Quality is not an issue. However, any assessment of program performance must be viewed

together with the fact that the funding support for programs has declined significantly over the past several years. This is particularly true for the number of doctoral degrees awarded, which is the College's greatest area of general concern. These numbers have declined over the past several years, along with the diminishing funding support for our graduate students.

A generally accepted guideline for assessing the viability of engineering programs is that doctoral programs should average at least three graduates per year, that master's programs should average at least four graduates per year, and that baccalaureate programs should average at least six graduates per year. The College's production of doctoral degrees is currently lower than projected by these guidelines in four out of five its doctoral programs. The only exception is our doctoral program in Computer Science. The College and University are making every effort to identify funding to support increased production of doctorates to a level of about 20 doctoral graduates per year.

With the exception of two new programs, all baccalaureate programs exceed the guideline. The first four graduates in Geomatics Engineering program were awarded degrees in Spring 2011. The program will be reviewed by ABET in Fall 2011. This is primarily an online program and the first of its kind in southeast USA. The program is headquartered in Port Saint Lucie. The College and the department are trying very hard to increase its enrollment. The program will certainly grow its enrollment and meet the expected guidelines for the number of degrees awarded. The Information Engineering Technology Program is also a new program and its enrollment has not grown as expected. The main reason is that during the past few years, Broward State College, Miami-Dade State College, Palm Beach State College, and Indian River State College have started offering four year degrees in Information Technology. The potential students have drifted away from our programs primarily due to economic reasons.

### **Computer and Electrical Engineering and Computer Science**

The department offers a full stack of degrees from baccalaureate through doctorate in computer engineering, electrical engineering, and computer science. In addition, the department offers a master's degree in Bioengineering and a baccalaureate degree in information engineering technology.

The department enrolls over half (51%) of the students in the College of Engineering and computer science. The annualized degrees awarded per faculty instructional year (per DDIs) are high in this department. The department has lost some faculty members during the past few years. This faculty attrition has impacted the department's research standing. The faculty attrition has also impacted the student/faculty ratios due to the recent positive trend in the enrollment growth. The University, the College, and the Department have been trying to address this situation. However, it is difficult due to the continued budget reductions. The staffing situation for teaching laboratories is also difficult and needs to be addressed. The merger of the departments has helped in addressing some of these concerns but nearly not enough to adequately address the situation.

Most of the undergraduate degree programs in the department are quite healthy as the DDI data shows. The new baccalaureate program in Information Engineering Technology has not been growing as expected. As mentioned earlier, the main reason is that during the past few years, State

Colleges have started offering four year degrees in Information Technology and have lured potential students away from this program probably due to economic reasons.

The master's degree in Bioengineering is growing but very slowly. The number of faculty members with expertise related to this program is very limited. The College and the department have stepped up marketing efforts to recruit more students for this degree program and involve local hospitals and professional community in this effort.

The enrollment in all the three doctoral programs is healthy. The doctoral program in computer science is doing well and can be improved. The number of graduates in the other two doctoral programs in computer engineering and in electrical engineering is low and the situation is being addressed. The support for graduate students in terms of research and/or teaching assistantships is one of the factors. The difficult job market and economic conditions are also impacting the motivation of doctoral students. The College and the Department have already put in place some policies for improving the graduation rates of our doctoral students.

The department is making excellent progress in maintaining and enhancing its research despite attrition of some very productive faculty members. Its relationships with industries for collaborative research are very strong. The department also reaches out to other institutions in the vicinity for joint research activities. It houses one of the NSF funded (jointly with FIU) Industry-University Collaborative Research Center (I/UCRC). Departmental leadership, along with its faculty, is placing increased emphasis upon research and graduate studies. This is fitting, as some of the best opportunities for research available to the College fall within the purview of this Department.

The department is exhibiting excellent progress in student satisfaction, scholarly activities and professional service. The Department of Computer and Electrical Engineering and Computer Science Engineering is a strong research program in terms of teaching, research and service. It can certainly reach the level of national and international prominence if its needs for junior faculty members can be met

Table 1 at the end of this report provides Dean's assessment of the programs in the Department of Computer and Electrical Engineering and Computer Science.

### **Civil, Environmental, and Geomatics Engineering**

The department offers degrees at the baccalaureate and master's level. The baccalaureate degree programs include Civil Engineering and Geomatics Engineering. The Geomatics Engineering program started about three years ago. Its current DDI data does not have much significance. The first group (four) of students graduated in Spring 2011. The program will be reviewed by ABET for the first time for accreditation in Fall 2011. We fully expect that the program will be accredited. The program is very unique and is expected to grow. The Master's degree program is doing very well and is growing. Leadership of the department has been very effective in establishing a productive and collegial atmosphere for faculty and students, in establishing ties with civil engineering business and industry, and in student recruitment.

The department does not have a doctoral program yet. For healthy growth in its research, the department needs a doctoral program. There appears to be a strong demand for this among

potential students and local business community. Even without a doctoral degree program, faculty members of the department are very active and enthusiastic in seeking sponsored research. In addition, there is also demand for a degree program in environmental engineering. The Department is ready to submit proposals for both the degree programs as soon as permission to do so is received.

The department is exhibiting excellent progress in student satisfaction, scholarly activities and professional service. The Department of Civil, Environmental, and Geomatics Engineering is doing well in all aspects. The research is growing and is expected to grow faster once its doctoral degree program is added, and additional research space and operational resources are provided.

Table 2 at the end of this report provides Dean's assessment of the programs in the Department of Civil, Environmental, and Geomatics Engineering.

### **Ocean and Mechanical Engineering**

The department has offers a full stack of degrees from baccalaureate through doctorate in ocean engineering, and mechanical engineering. The department leads the College in terms of funded research – more than 50% of the College's funded research is in this department. The department has hired a new chair who joined on June 1, 2011. His startup package included funds for improving teaching laboratories in the departments. Hiring of two new faculty members has also been authorized by the Provost's office as part of his start-up package.

The Ocean Engineering program is the College's most prominent program. It is high in quality, broad in scope, and enjoys international reputation of excellence. The undergraduate program has picked up significant enrollment over the past three years. The master's degree enrollment has also grown in recent years. The doctoral enrollment has been steady and the doctoral graduation rate has been low. Some of this can be attributed to retirement and relocation of some of the faculty members. The Department and the College is addressing that aspect and allocating resources to increase doctoral enrollment and improve graduation rates.

The Mechanical Engineering program has a solid foundation. Its undergraduate program is very healthy. The graduate programs (master's and doctoral) need to be strengthened. The master's degree enrollment has seen some growth in recent years. The doctoral enrollment is low and declining. Immediate steps are needed to reverse the trend. With the relocation of supporting industry, the department needs to transition to a new identity and new areas of activity. New leadership of the Department and the College are working together on these aspects. The leadership is also poised to collaboratively work with other entities in the University including Harbor Branch on academic matters and research activities.

The department is exhibiting excellent progress in student satisfaction, scholarly activities and professional service. The new leadership of the department is working on building an environment for supporting strong academic program and for sustained research activities.

Table 3 at the end of this report provides Dean's assessment of the programs in the Department of Ocean and Mechanical Engineering.

## SUMMARY

Three key points that emerge from this process of program assessment are:

- Program performance for most of the baccalaureate programs is satisfactory and needs to be maintained at least at the current levels or higher. The new program in Geomatics Engineering will undergo ABET review in Fall 2011 and is expected to be accredited. The viability of the baccalaureate program in Information Engineering Technology will be carefully assessed in Fall 2011 to make a decision about its future.
- The College's Innovation Leadership Honors Program is available to all undergraduate majors in the College. The College is carefully addressing the needs of this program to make it successful.
- Most of the master's programs are performing well. The growth and graduation rates of three of the master's programs need attention and can be improved. Leadership of the departments and the college are working together to address this aspect.
- The graduation rates for four out of five doctoral programs are lower than the acceptable levels. Again the leadership of the departments and the college are working together to address this aspect.
- The College and its departments need to embrace new and emerging areas in engineering not only to address the current needs but also to competitively position itself for enhancing its research funding and to attract highly qualified graduate students.
- Although the College has recently moved into a new 97,000 square feet building, the additional space it gained is only about 30,000 square feet. There is a strong need for teaching laboratories for our growing undergraduate programs in Civil Engineering, Mechanical Engineering, and Ocean Engineering.
- There is a strong demand among student and local business community for a doctoral program in Civil Engineering. Addition of this program will enhance the potential for increasing sponsored research.

The College is in process of realigning its priorities to address upcoming budget reductions and shortages of resources. Primary focus will be on improving research and graduate studies and providing an environment for students, faculty, and staff to thrive and become ambassadors of the departments, the college, and the University.



Table 1: Performance of Computer and Electrical Engineering and Computer Science.

DEAN'S EVALUATION OF PERFORMANCE Department of Computer and Electrical Engineering and Computer Science S = Satisfactory U = Unsatisfactory			
Degrees Programs			
Item	UG	MS	PhD
Enrollment / Degrees awarded – Bioengineering	N/A	S-	N/A
Enrollment / Degrees awarded – Computer Engineering	S	S	U*
Enrollment / Degrees awarded – Computer Science	S	S	S
Enrollment / Degrees awarded – Electrical Engineering	S	S-	U*
Enrollment / Degrees awarded – Information Engineering and Technology	U**	N/A	N/A
Other Departmental Aspects			
Student Satisfaction	S		
Funded Research	S-		
Scholarly Activities	S		
Service	S		

*The '\*' means that the current graduation rates of doctoral graduates is low. The Department and the College are working together to improve the graduation rates.  
 The '\*\*' means that the program is relatively new.*

Table 2: Performance of Civil, Environmental, and Geomatics Engineering.

DEAN'S EVALUATION OF PERFORMANCE Civil, Environmental, and Geomatics Engineering S = Satisfactory U = Unsatisfactory			
Degree Programs			
Item	UG	MS	PhD
Enrollment / Degrees awarded – Civil Engineering	S	S	N/A
Enrollment / Degrees awarded – Geomatics Engineering	S	N/A	N/A
Other Departmental Aspects			
Student Satisfaction	S		
Funded Research	S-		
Scholarly Activities	S		
Service	S		

Table 3: Performance of Ocean and Mechanical Engineering.

DEAN'S EVALUATION OF PERFORMANCE Department of Ocean and Mechanical Engineering S = Satisfactory U = Unsatisfactory			
Degree Programs			
Item	UG	MS	PhD
Enrollment / Degrees awarded – Mechanical Engineering	S	S-	U*
Enrollment / Degrees awarded – Ocean Engineering	S	S	U*
Other Departmental Aspects			
Student Satisfaction	S		
Funded Research	S+		
Scholarly Activities	S		
Service	S		

*The '\*' means that the current graduation rates of doctoral graduates is low. The Department and the College are working together to improve the graduation rates.*