

**SEMINOLE STATE COLLEGE
ASSOCIATE IN SCIENCE FOR PRE-ENGINEERING (214)**

Program Review Summary

October 1, 2018

Introduction

The mission of Seminole State College is to empower people for academic success, personal development, and lifelong learning. To that end, the College offers twenty-three degree/certificate programs, including the Associate in Science for Pre-engineering. In accordance with requirements set forth by the Oklahoma State Regents for Higher Education, the College conducts a thorough review of this degree program every five years. The Science, Technology, Engineering, and Mathematics Division presents the results of its self-review of the Associate in Science for Pre-engineering.

Assessment of this transfer degree program employed a number of direct and indirect indicators. The focus of this process was to evaluate degree program productivity and the achievement of specific degree program and general education outcomes by students. Additionally, this review relates these findings to a number of relevant Higher Learning Commission Criteria and Components and the educational mission of the College. Based on the information presented here, the academic division makes recommendations regarding the degree program.

3.7.5 Process (Internal/External Review): Self-review by academic division

Previous Reviews and Actions from those reviews: In the previous review, recommendations focused on tracking students through a variety of methods including web based surveys email communications.

Analysis and Assessment (including quantitative and qualitative measures) noting key findings from internal or external reviews and including developments since the last review:

Analysis of degree program productivity revealed that the degree program averaged 27 declared majors per year with 6 graduates annually and 1,716 total credit hours generated per year over the period under review. Other direct indicators used were course-embedded assessment and ACT Collegiate Assessment of Academic Proficiency (CAAP) Test. Principal indirect indicators used were the Faculty Survey on Student Engagement (FSSE), the Entering Student Engagement Survey (ESES), and the SSC Graduate Exit Survey (GES). Students increased knowledge by 42% to 55% in a comparison of the pre-test and post-test scores. The CAAP test scores reflect learning in line with the national averages. The data reported on the FSSE reflected the efforts by faculty to engage students through classroom discussions, more frequent grade reporting, problem-based learning, and increased direct interaction with students. On the ESES, 81.4% of the students reported having already declared a major in the first 5 weeks of their first semester at SSC. Students responding to the Graduate Exit Survey declared that the quality of teaching in their major field of study was above average at a rate of 74.4%. According to the GES, 84.1% of students plan to transfer after graduation while 84.1% stated they would choose SSC again if starting over.

Key findings from the most current evaluation of the Associate in Science for Pre-Engineering

First, analysts found that instructors and counselors should be more active in recruiting students to declare Pre-Engineering as a major. Second, faculty in the STEM Division discovered a need to create a plan to increase student awareness of the advantage of receiving an associate degree before transferring to a four-year institution. Third, analysis of data revealed a continuing issue with the number of students allowed to enroll in Liberal Studies, leading to the conclusion that more concerted effort should be made to encourage students in selecting a specific major.

A. Centrality of the Program to the Institution's Mission:

SSC Mission Statement

Seminole State College empowers people for academic success, personal development, and lifelong learning.

The Associate in Science for Pre-Engineering Degree Program:

Empowers people for academic success by preparing students for a range of careers involving Engineering and at the same time improve their critical thinking skills necessary for success in all studies.

Empowers people for personal development by training students to set and achieve educational goals by developing responsibility, organizational skills, and academic skills. The program places students in appropriate developmental or college level courses, allowing students the opportunity to progress through the curriculum to achieve success.

Empowers people for life-long learning by providing a variety of courses that vary in content and have the purpose of broadening a student's appreciation of and creating a desire for continued learning once they have completed their education.

Seminole State College prepares students to continue their education beyond the two-year level, trains students for careers and other educational opportunities, and makes available resources and services designed to benefit students and the community at large. Seminole State College also enhances the capabilities of individuals to achieve their goals for personal development by providing quality learning experiences and services that respond to diverse individual and community needs in a changing global society.

B. Vitality of the Program:

B.1. Program Objectives and Goals:

Associate in Science for Pre-Engineering Degree Program Outcomes Outcomes for Transfer Degree Programs

Outcome 1: Demonstrate successful articulation of Seminole State College transfer degree programs to state and professional institutions of higher learning granting professional and baccalaureate degrees in Oklahoma.

Outcome 2: Demonstrate successful academic achievement by Seminole State College transfer degree students at primary receiving state baccalaureate institutions of higher learning in Oklahoma. Successful academic achievement is defined as the

maintenance of satisfactory academic progress toward degree completion as determined by the receiving institution.

Outcomes Specific to Associate of Science for Pre-Engineering

Outcome 3: Define and explain fundamental concepts, principles, and theories of engineering.

Outcome 4: Gather scientific information through experiments and interpret and express the results of experiments.

Outcome 5: Demonstrate problem-solving skills foundational to understanding of engineering concepts.

Outcome 6: Demonstrate preparation for continued pursuit of engineering education leading to a baccalaureate degree in an engineering area.

B.2 Quality Indicators (including Higher Learning Commission issues):

The SSC Pre-engineering Degree Program fulfills Higher Learning Commission Criteria by providing evidence of student learning, faculty engagement that encourages quality teaching, and effective assessment of the student learning process. Instructors in the Mathematics and Science areas consistently review assessment tools and methods and revise those tools and methods, when necessary, to provide the most accurate assessment data possible. To measure the two outcomes specific to the Pre-Engineering Degree Program course embedded assessment is the foremost method. In the Mathematics and Science areas, instructors used pre-tests and post-tests as the tools to obtain assessment data. Faculty members regularly review and change pre-test and post-test questions when necessary. For example, in the past year mathematics and science faculty members have reviewed the pre-tests and post-tests in College Algebra, General Biology, Zoology, Anatomy, Physiology, Astronomy, Microbiology, Principles of Biology, Earth Science, and Introduction to Engineering. As a result, instructors have rewritten, replaced, or deleted some of the existing questions. The FSES affirms that instructors participate in a variety of engagement techniques to teach students.

Instructors calculate student score improvements from pre-test to post-test for every class every semester. While pre-tests and post-tests only assess improvements in a sampling of course objectives, the fact that all courses in the Mathematics and Science areas show improvement verifies that student learning takes place and that outcomes specific to the Pre-Engineering Degree Program are met.

As an example, key personnel gathered the course embedded assessment data from the fall 2017 to summer 2108 semesters as shown in the following table. The percent of increase reflects the difference between the average of the post-test scores and the pre-test scores. For the Major Field Requirement courses, the average growth rate was above 44.4% while the post-test results ranged from 61% to 80%. Since 60% is considered passing, we will continue to expect improvement in some areas. For the degree program outcomes, student post-test scores range from 70% to 73% with differences between 52% and 61% indicated a substantial gain in knowledge for the students.

**Table 1. Combined Course Embedded Assessment Results For Fall 2017 through Summer 2018
for Major Field Courses in Degree Program**

General Education Outcomes	Pre-Test % Correct	Post-Test % Correct	Difference
General Education Outcome 1	25%	80%	55%
General Education Outcome 2	25%	78%	53%
General Education Outcome 3	21%	65%	44%
General Education Outcome 4	9%	61%	52%
Specific Outcomes for Pre-Engineering Degree Program	Pre-Test % Correct	Post-Test % Correct	Difference
Degree Program Outcome 3	21%	73%	52%
Degree Program Outcome 4	22%	73%	52%
Degree Program Outcome 5	9%	70%	61%
Degree Program Outcome 6	9%	70%	61%

B.3. Minimum Productivity Indicators:

The following table provides data for the Pre-engineering Degree Program. Report Date August 2018

**Table 2
Pre-engineering Declared Majors and Graduates**

Academic Year	Semester	Declared Majors	Graduates Total Per Year
2013 - 2014	Summer 2013	13	0
	Fall 2013	29	1
	Spring 2014	24	5
2014 - 2015	Summer 2014	10	1
	Fall 2014	33	1
	Spring 2015	35	5
2015 - 2016	Summer 2015	7	0
	Fall 2015	39	0
	Spring 2016	36	1
2016 - 2017	Summer 2016	10	0
	Fall 2016	39	1
	Spring 2017	37	4
2017 - 2018	Summer 2017	9	1
	Fall 2017	41	0
	Spring 2018	37	7

In Table 2, the results show approximately 27 students selecting the program each year and about 6 successfully completing the program annually. This degree program has a low to moderate demand level. However, relative to the number of students declaring Pre-Engineering as a major, the graduation rate is low. Analysts partially attributed the low graduation rate to the concept that many of the students who declare Pre-Engineering as their major succumb to the rigor of the courses and do not complete their degree or decide to change majors. Additionally,

some students transfer to other institutions before completing an associate degree at Seminole State College. Nationally, the Pre-Engineering degree is a low demand and a low productivity degree.

This data shows that the Pre-Engineering Degree Program on average exceeds the minimum standards of productivity for Majors Enrolled (25) and Degrees Confirmed (5) with very few exceptions.

B.4. Other Quantitative Measures:

- a. Number of courses taught exclusively for the major program for each of the last five years and the size of classes:

Table 3. Number of Sections Taught and Enrollment for Each Course in Major Field of Degree Program

Prefix	Number	Major Field Course Title	Number of Sections	Total Students	Ave. Class Size	Credit Hours
ENGR	1113	Introduction to Engineering	6	81	14	243
CS	2013	Programming in C++	6	63	14	189
MATH	2215	Calculus and Analytic Geometry I	8	114	7	570
MATH	2424	Calculus and Analytic Geometry II	8	56	7	224
PHYS	2114	General Physics I	6	109	18	436
PHYS	2211	Calculus Based Physics I	10	54	5	54

- b. Student credit hours by level generated in all major courses that make up the degree program for five years:

Table 4. Credit Hours Generated in Major Field Courses By Level

Academic Year	1000 Level Credit Hours Generated	2000 Level Credit Hours Generated
2017-18	54	345
2016-17	54	395
2015-16	69	306
2014-15	27	206
2013-14	39	218
Totals	243	1473

Table 4 shows the credit hours generated by all the major courses of the degree program for the given academic years. The hours do not represent the number of student credit hours generated only by those students declaring Pre-engineering as their major.

- c. Direct instructional costs for the program for the review period:

Instructional Cost (Estimate):

No direct data was available that could be used to determine the exact amount of the instructional cost for any of the math and science degree programs. The annual SSC budget report provided the total expenditures for the science department as shown in Table 5. The annual science department budget contains the instructional costs for the STEM division degree programs.

Academic Year	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
Instructional Cost	\$423,548	\$460,621	\$459,621	\$463,449	\$462,949

d. The number of credits and credit hours generated in the program that supports the general education component and other major programs including certificates:

Support of General Education Outcomes

All courses offered in the Mathematics and Science areas support the General Education Philosophy of Seminole State College. Mathematics and Science instructors make every effort to provide experiences that will equip students with the necessary skills to make informed decisions and encourage life-long learning. Instructors also attempt to provide experiences that will make students into citizens who will be thoughtful about their attitudes toward human life, cultural diversity and biological and physical environments. Please see Table 5 for a list of student credit hours generated in the major courses

All college level courses in the Mathematics and Science areas at Seminole State College support one or more of the General Education Outcomes. As students move through the course offerings of the Pre-Engineering Degree Program, they will eventually achieve all four General Education Outcomes. To illustrate this support of the General Education Outcomes the following table shows the Major Field Recommendation courses for the Associate in Science for Pre-Engineering Degree Program and the General Education Outcomes each course addresses.

Note: Three of the Major Field Recommendation courses address no identified General Education Outcomes. Upon investigation, faculty found that the courses exist in our course inventory, but no instructor has taught the courses in fourteen years. Faculty members revised the General Education Outcomes approximately ten years ago, and as a result, the association of these courses with the revised General Education Outcomes has never been established.

Table 6
All General Education Outcomes addressed by a specific course are marked with the letter "X."

Major Field Recommendation Course Information			General Education Outcome			
Prefix	Number	Title	1	2	3	4
ENGR	1113	Introduction to Engineering	X	X	X	X
MATH	2215	Calculus and Analytic Geometry I	X	X	X	X
MATH	2424	Calculus and Analytic Geometry II	X	X	X	X
PHYS	2114	General Physics I	X	X	X	X
PHYS	2211	Calculus Based Physics		X		

e. A roster of faculty members, faculty credentials and faculty credential institution(s). Also include the number of full time equivalent faculty in the specialized courses within the curriculum:

Current STEM Division Faculty Teaching Major Field Requirements

Table 7

Current Full-Time STEM Faculty			
Name	Teaching Area	Highest Degree	Institution
Goeller, Linda	Mathematics	Ph.D.	Oklahoma State University
Bryant, Melissa	Mathematics	M.Ed.	East Central University
Tollett, Jarrod	Mathematics/Science/Engineering	M.Ed.	East Central University

f. If available, information about employment or advanced studies of graduates of the program over the past five years:

One student currently at the University of Oklahoma studying Engineering and interning for Georg Fischer Central Plastics. One student graduated from Oklahoma State University in Engineering and is employed with Boeing. One student graduated University of Oklahoma in Electrical Engineering and is employed with OG&E. One student currently at Oklahoma State University studying Chemical Engineering. Three students currently at University of Central Oklahoma studying Engineering.

g. If available, information about the success of students from this program who have transferred to another institution:

Transfer Reports from Four-Year Institutions:

Seminole State College routinely seeks transfer data from the primary transfer baccalaureate institutions. Transfer reports received from East Central University, the University of Central Oklahoma, University of Oklahoma, and Oklahoma State University provided GPAs of students who had transferred from Seminole State College. Data in the Transfer Reports from Four-year Institutions 2017-18 shows that Seminole State College students have higher overall GPA's than the four-year institution average. The data in the reports confirmed our expectation that SSC students maintain similar GPAs upon transfer as those attained at SSC and verified the competence of SSC students in their academic preparation.

B.5. Duplication and Demand:

B.5. Duplication and Demand Issues:

Review of Duplicated Programs

Other institutions have similar programs to the Pre-Engineering Degree Program at Seminole State College. The only near duplications (in our five county area) are at a few private schools that are cost prohibitive for many students.

The Pre-Engineering Degree is a moderate demand program and the rates of declared majors and graduation generally exceed OSRHE productivity levels. Our function at Seminole State College is to provide local access to those students in our five county service area wishing to pursue the Pre-Engineering Degree.

B.5.a. Detail demand from students, taking into account the profiles of applicants, enrollment, completion data, and occupational data:

The Pre-Engineering Degree is a low to moderate demand program and the rates of declared majors and graduation exceed OSRHE productivity levels. Approximately 27 students selected the Associate in Science in Pre-Engineering degree program each year over the review period. Six students in 13-14, 7 students in 14-15, 7 in 15-16, 5 in 16-17, and 8 in 17-18 successfully completed the program. This degree program possesses an average demand level. Relative to the number of students declaring Pre-Engineering as a major, the graduation rate is low at 6.8%.

B.5.b. Detail demand for students produced by the program, taking into account employer demands, demands for skills of graduates, and job placement data:

Faculty members expect students with a Pre-Engineering Degree to matriculate to a four-year program. The options available to these students include any engineering field.

B.5.c. Detail demand for services or intellectual property of the program, including demands in the form of grants, contracts, or consulting:

Not applicable to SSC.

B.5.d. Detail indirect demands in the form of faculty and student contributions to the cultural life and well-being of the community:

Although many of the faculty members commute, they also participate in community activities such as blood drives, Rotary Club, Lion's Club, churches, and the local chambers of commerce. Faculty members and students are active in the five county area served by SSC.

B.5.e. The process of program review should address meeting demands for the program through alternative forms of delivery. Detail how the program has met these demands:

With the advances in technology, faculty members have the opportunity to expand to several different forms of delivery. Although still experimenting with new methods, faculty members have found that blended courses prove to be successful delivery methods. SSC also addresses the community need for a variety of course scheduling by offering night courses, weekend courses, 8-week courses, Saturday courses, and courses at the prison.

B.6. Effective Use of Resources:

Staff Support

The STEM Division has a full-time secretary who primarily supports the Division Chair, and secondarily supports the other functions of the division including purchasing, maintaining budgets and various records, and facilitating the various needs of the STEM faculty members. There are currently two student wage students working for the STEM Division.

Educational Technology Support

The infusion of technology into academic programs and processes currently receives priority implementation and funding at Seminole State College. Through this focus, the College creates a technologically enhanced academic environment focused on student learning. As a result, technology has never been a limiting factor in classroom instruction. Primary funding sources

are E&G funds, federal grants, dedicated student fees, and private donations.

Seminole State College installed a wireless network with two control centers providing Internet and Seminole State College Intranet connectivity to campus academic and residential buildings. In addition to wireless connectivity, all classrooms are hard-wired for Internet and Seminole State College Intranet access. Students have access to personal email accounts, online enrollment, student records, and can obtain copies of their transcripts online. Students may use one of the computers in 16 computer labs stationed across campus to access these sites.

Technologically equipped classrooms have computer systems with current instructional and multimedia software, CD/DVD/VCR players, digital multimedia projectors and a Smart Board. Classrooms equipped for Zoom and IETV have full-motion video/audio interactive television technology interfaced with fiber optic transmission equipment and a computerized multimedia projection system for OneNet course sharing. Faculty members use the internet for instructional activities and information research in courses throughout the curriculum.

Technological services provided by the Testing Center include computerized Advanced Placement testing, class placement testing, ACT residual testing, telecourse testing, and technologically-aided ADA appropriate testing for students with special needs.

Instructional Technology Support Services

Maintaining all forms of technology used in instruction requires a qualified support team. Seminole State College has just such a team made up of the MIS director and two tech persons. They are responsible for maintaining all campus technology such as computers, Smart Boards, IETV and Zoom equipment, and keeping the campus Intranet and Internet operable in all offices and classrooms.

Web-based Support Services

Brightspace is available to instructors for course management and not just for online course delivery. Through MySSC, instructors report student grades electronically, receive emergency response, and make announcements.

Institutional Program Recommendations: (describe detailed recommendations for the program as a result of this thorough review and how these recommendations will be implemented, as well as the timeline for key elements)

Table 8

Recommendation	Implementation Plan	Target Date
The degree program mentor will encourage and recruit students through a variety of methods to declare Pre-Engineering as their major	Led by the degree program mentor, STEM faculty will increase efforts to recruit Pre-Engineering majors by encouraging SSC students to choose Pre-Engineering as a major and by recruiting area high school students to choose the major.	On-going
Faculty, advisors, and the student success committee will	The degree program mentor will consult with faculty,	On-going

increase student awareness of the advantage of receiving an associate degree before transferring to a four-year institution	advisors, and the student success committee to create a plan to increase student awareness of the advantages of receiving an associate degree before transferring.	
Faculty and specifically STEM faculty will encourage students to enroll in specific degree programs rather than choosing Liberal Studies	Faculty, along with student support services, will continue the efforts to inform students of the advantages of enrolling in a specific degree program	On-going

Summary of Recommendations:

	Department	School/College	Institutional
Possible Recommendations:			
Expand program (# of students)	We recommend expanding the program by 20% or about 5 student per year.		

Department/
Program Head _____
(Signature)

Date _____

Dean _____
(Signature)

Date _____