Oklahoma City Community College

Program Review Self Study Year: 2016
Division of Mathematics, Engineering, and Physical Science
Associate in Science in Engineering
Prepared by: Dr. Greg Holland

I. Introduction

This section should reference the general process of the review and any unique features of the review (such as the use of outside consultants or conducting the review in relation to an accreditation visit).

If the program has been reviewed previously, this section should include a brief summary of prior recommendations and how they were addressed.

This review was compiled by Dr. Greg Holland, Professor of Engineering at Oklahoma City Community College. Dr. Holland has also been the Engineering Program Director for the past 11 years. Data contained in this report have been compiled from course grades provided by the Division of Math, Engineering, & Physical Sciences along with data compiled by Planning and Research.

Previous recommendations included the need for more faculty, the need for more space, and a desire to reduce the need for dual-enrollment while students are transitioning to a transfer institution.

The need for more faculty has been met by hiring adjunct professors.

No new classroom, laboratory, or student study areas have been added since the Engineering Center was completed in 2009.

Degree plans for students studying mechanical, industrial, or electrical engineering do not require dual enrollment for students if they follow the indicated schedule. This covers approximately 1/3 of OCCC Engineering students.

II. Executive Summary

The Executive Summary will include the program's connection to the institution's mission, program objectives, and the strengths and areas for improvement of the program. It will also include the key findings and recommendations of the internal or external reviews with regard to the Program Review Principles and Program Review Criteria.

The Engineering Program has experienced substantial growth over the last 5 years. The number of AS degrees awarded in Engineering have increased from 27 to 52 over that time. The number of enrolled engineering majors over the same period has increased from 675 to 1330. This growth is due to several factors: consistent quality from faculty, regular course offerings at convenient times, regular assistance from tutors, and a high degree of course transfer. These factors provide excellent opportunities for both traditional and non-traditional students seeking a university parallel track in engineering. The Engineering Program at OCCC has captured approximately 75% of the market share in the Oklahoma City Metro region and is highly regarded by transfer institutions such as the University of Oklahoma, Oklahoma State University, and the University of Central Oklahoma.

The return of ENGR 1113 "Introduction to Engineering", beginning in the fall of 2016 will provide a much-needed opportunity for engineering faculty to have contact with majors and guide their academic planning at a much earlier stage than what has been typical with the previous course that provided the initial contact between engineering faculty and engineering students, ENGR 2002 "Professional Development".

Additional full-time engineering faculty are needed to maintain consistent, quality instruction and to handle the continuing growth of the program. Full-time engineering faculty in both mechanical and electrical fields would improve the reliability and quality of instruction while providing opportunities to enhance opportunities for electrical and computer engineering majors. Additional full-time faculty would also provide opportunities to develop an array of special topics courses that would allow better leverage of the equipment and facilities the program possesses. Additional space for faculty and classes will be needed as well.

III. Analysis & Assessment

This section will include a complete review and analysis of the Program Review Criteria based on the internal or external team's review. It will also assess developments since the last program review in the context of the current recommendations of the internal review and any recommendations.

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

An assessment and written analysis as to the centrality of the program to the institution's mission and in the context of the institution's academic plan are required. The purpose of the mission of an institution is to indicate the direction in which the institution is going now and in the future. The mission defines the fundamental reason for the existence of the institution.

Together with the planning principles and goal statements, the mission reveals the philosophical stance of the institution with respect to education and learning while at the same time providing a framework for the maintenance of institutional integrity and development.

Describe how the program is central to the institution's mission:

Oklahoma City Community College Mission Statement

OCCC provides broad access to learning that empowers students to complete a certificate or degree and that enriches the lives of everyone in our community.

- Access: Our community has broad and equitable access to both highly valued certificate and degree programs and non-credit educational opportunities and events.
- College Readiness: Our students develop skills and knowledge required to succeed in college.
- Student Success: Our students successfully complete their academic courses, persist in college, and earn certificates or degrees at OCCC or another institution.
- Graduate Success: Our graduates go on to earn higher-level degrees or are successful in technical or professional careers.
- Community Development: Our community's quality of life is enriched through our educational, artistic and recreational programs and events.

The Engineering Program supports the College's mission by providing broad and equitable access to a University parallel engineering curriculum for students from many walks of life, including first-generation college students, students returning to college after time away, and students who work full or part-time.

This program provides access to highly-sought-after STEM career paths in engineering. Our graduates enter fields that are among the highest paid and most critically needed nationally. A recent study (The Economic Value of College Majors, 2015) shows that 17 of the top 25 highest paying areas are in engineering fields.

B. Vitality of the Program

Vitality of the program refers to the activities and arrangements for insuring its continuing effectiveness and efficiency. To maintain its vitality and relevance, a program must plan for the continuous evaluation of its goals, clientele served, educational experiences offered, educational methods employed, including the effective incorporation of technology, and the use of its resources. This vital principle or force can best be observed by examining the past and present initiatives to insure the vitality of the faculty, students, and program.

1. List Program Objectives and Goals

Program Objectives and Goals are defined in the annual AOPC Report:

Provide rigorous and consistent engineering instruction for students working toward a BS degree in engineering, with competencies in communication and analytical methods.

Provide flexible course scheduling during evenings and summer semesters, to students with non-traditional schedules.

Provide courses on a regular and frequent basis, to allow a continuous progression toward degree completion.

Provide trouble-free transferability of course credits to other institutions.

2. Quality Indicators

Quality indicators may vary by institutional mission; however, institutions should measure the efforts and quality of their programs by: faculty quality, ability of students, achievements of graduates of the program, curriculum, library, access to information technology resources including efficiencies and improved learner outcomes through appropriate use of this technology and appropriate use of instructional technology to achieve educational objectives, special services provided to the students and/or community, and other critical services.

As appropriate, institutions should evaluate the program against industry or professional standards utilizing internal or external review processes. Institutions must provide specific documentation of student achievement. Such documentation should include programs outcomes assessment data consistent with the State Regents' *Assessment Policy*. Program quality may also be reflected by its regional or national reputation, faculty qualifications, and the documented achievements of the graduates of the programs. This includes a program self review that provides evidence of student learning and teaching effectiveness that demonstrates it is fulfilling its educational mission and how it relates to Higher Learning Commission Criteria and Components listed below:

a. The program's goals for student learning outcomes are clearly stated for each educational program and make effective assessment possible. List of the student learning outcomes.

Learning outcomes were assessed from 2011 to 2015 and are listed in the annual AOPC report.

Outcome #1: Students will possess knowledge and problem solving abilities appropriate for each of the engineering science courses they take at OCCC.

Outcome #2: Students will be able to effectively communicate technical issues in an oral presentation.

Well-defined the criteria for measurement and how the criteria were used in the program.

Outcome #1: At the end of each semester, students were given comprehensive final exams in each of the engineering science (ENGR) courses. At least 70% should score a "C" or better.

Outcome #2: Students in ENGR 2002 "Professional Development" were required to choose a technical engineering research journal article and give a 10-12 minute PowerPoint presentation in front of their class. At least 70% should score a "C" or better.

The evaluation, results, and recommendations based on the criteria used.

Outcome #1: 699 out of 1034 students (68%) scored a "C" or better on their comprehensive final exams. While this is close to the 70% target, engineering faculty continue to stress the importance of learning fundamental concepts at the onset of a course that directly affect student performance throughout the course and ultimately, on the final exam. Faculty have a strong mentoring role, guiding students as they learn to organize course materials, manage their time more effectively, and explore study habits that may be more effective based on their particular learning style.

Outcome #2: 268 out of 279 students (96%) scored a "C" or better on their technical oral presentation. No changes were deemed necessary based on these results.

The General Education Core

General Education at Oklahoma City Community College is an integral component of each student's experience. Every student receiving an Associate Degree (AAS, AA, or AS) must complete at least one course from each of the following areas, indicating a general understanding of that area.

Human Heritage, Culture, and Institutions
Public Speaking
Writing
Mathematical Methods
Critical Thinking

Strategy:

The General Education Committee will create five interdisciplinary teams with members from multiple divisions. Each team will consist of five members with two members specifically teaching in one of the General Education Core Areas. Also, at least one team member will be a representative of the General Education Committee.

Twice a year these teams will evaluate one hundred artifacts from students having attained at least 35 hours of General Education Courses from OCCC. Reports, recommendations, and actions created from the General Education Assessment Process will be stored on the General Education Committee Website.

General Education Assessment Plan

Objective:

To assess and recommend actions for the general education component of Oklahoma City Community College's curriculum.

Method:

Developed rubrics will provide common criteria for assessing “artifacts” gathered from various courses. Artifacts may include but are not limited to recorded performances, PowerPoint Presentations, essays, lab reports, research projects, service-learning projects, or any assignment preexisting in a faculty's course.

Nevertheless, the underlying principle of this method is (1) to reduce the intrusive nature of assessment within faculty courses, (2) to create a real environment of student performances within a classroom setting instead of a contrived environment of a forced examination (i.e. CAAP exams not counting for a classroom grade), and (3) to collect artifacts already designed and administered by our professional faculty at OCCC.

Data Collection:

The Office of Institutional Effectiveness will identify each semester students completing at least 35 credit hours in General Education Courses.

Program Response to General Education Assessment Data

General Education requirements represent just over sixty percent of each Associate of Science or Associate of Arts degree, making the careful assessment of these broad competencies OCCC considers essential for all graduates very important. All programs (terminal or transfer) to be evaluated contain at least 18 general education hours within the curriculum. OCCC has six general education learning outcomes that we expect all of our students to be proficient in upon graduation, they are: human heritage, culture, values and beliefs; writing; public speaking; mathematical methods; social institutions; and critical thinking. Provide evidence that shows your participation in submission of artifacts, what types of artifacts are being submitted, and how you have used the general education assessment data to inform curricular refinement and to achieve these general education outcomes in your students in your program.

The oral presentations used as part of the program's learning outcomes assessment are provided as artifacts to the Gen Ed Assessment committee each year for the purpose of evaluating public speaking proficiency. These artifacts will be replaced by similar artifacts from the recently implemented ENGR 1113 course.

Opportunities for providing additional artifacts on math and critical thinking proficiency are currently being explored.

Although artifacts have been provided to the General Education Assessment committee, no useful results have been returned, despite numerous requests. Assessment data that indicates assessment criteria needs to be broken down by course and instructor and returned in a timely manner so that the program may implement changes to address apparent deficiencies in instruction.

b. The program values and supports effective teaching.

Faculty Performance Review and Evaluation

Faculty will be evaluated on the basis of the established standards of performance and objectives established in the person's contract and any subsequent memorandums of agreement established for the position/person. Faculty are defined as employees who primarily perform teaching and instruction-related duties and who are employed on the basis of a written contract setting forth the duties to be performed and the compensation to be paid. The performance appraisal for each faculty member will be conducted by the Division Dean or Director as appropriate.

Course and Faculty Evaluation

The Student Input on Instruction process is a means of gathering student perceptions of instruction at the college. The results are intended to be used by you and your dean in identifying ways to improve instruction.

Students will receive an email during the 6th and 7th week for the first 8- week classes and the 14th and 15th week for the second 8-week courses and 16-week courses. The email will include the information to evaluate each course. The window for replying to these surveys will be closed at the end of the designated weeks. Faculty will not have access to their SII results until after grades have been turned in.

c. The program creates effective learning environment.

The learning environment for engineering majors is outstanding at OCCC. The engineering lab contains study/tutorial space, laboratory space and space for hands-on application of engineering principals. These include such diverse areas as welding and atomic force microscopy. The lab also contains computing resources for students.

The engineering club is very active and helps our majors find academic and emotional support from peers and from the guest speakers from industry and universities who regularly speak at meetings. Engineering, physics and mathematics professors also serve as the students' faculty advisors.

Classes are offered in the morning afternoon and evenings so that students can find a section that matches their schedules. Engineering, physics and calculus class offering are carefully coordinated so that students can take courses from each of these areas during the same semester.

d.The program's learning resources support student learning and effective teaching.

Library collection evaluation - Engineering
Fall 2015

Print and Online Resources

The OCCC Library's broad array of resources supports the Engineering program and general education courses within that program. The collection includes regular books, ebooks, DVDs, online streaming videos, searchable article databases and a number of specialized online resources useful in the subject areas and courses in the program.

Most notably, students can now find engineering information in searchable collections (databases) of academic level and peer-reviewed articles, such as EbscoHost. It is simple to search specific topics. On the other hand if a faculty member wished to direct students to specific articles, those can usually be found in EbscoHost and then made easily available within the Moodle courseware with a permanent URL. Students and faculty have access to articles in several hundred engineering and related periodicals.

Other online resources for both students and engineering faculty are *Films on Demand* with its nearly 20,000 documentaries and ImageQuest Database, a source of literally millions of images that can be used for student or faculty projects. The AV collection -mostly DVDs --continues to be well used, but increasingly online streaming videos are chosen by faculty and students where available.

One of the most popular services is the Library's textbooks on Reserve program. Copies of most current textbooks are available for students to use in the building. Major textbooks specific to engineering major courses used in the Fall 2015 semester get substantial use. They are listed below with numbers of checkouts so far:

Course Title	Textbook Title	Checkouts
ENGR 2133/Rigid Body Mechanics	*Engineering Mechanics*	7
	Engineering Mechanics, v.1, Statics	192
ENGR 2143/Strength of Materials	*Mechanics of Materials*	95
ENGR 2523/Engineering Dynamics	*Engineering Mechanics-Dynamics*	63
ENGR2002/Eng. Professional Devel.	*Engineering Your Future*	13
ENGR 2303/Materials, Design & Mfg. Proc.	*Manufacturing Eng & Technology*	20
ENGR 2333/Thermodynamics	*Fundamentals of Eng. Thermodynamics*	130
ENGR 2343/Fluid Mechanics	*Fluid Mechanics*	40
ENGR 2613/ Electrical Science	*Engineering Circuit Analysis*	170

The largest collection of materials supporting the Engineering program is in the circulating collection. This section of engineering materials needs a thorough review, including weeding of crumbling and outdated items and purchase of appropriate new materials. This will be accomplished in conjunction with engineering faculty.

Materials in the following call number areas support the Engineering program:

T 351 - 385 Engineering graphics
TA 1 - 2040 Engineering (general), esp. mechanics of engineering, applied mechanics materials of engineering & construction, strength of materials, testing & properties of materials.
TC 1 - 1665 Hydraulic engineering, fluid flow, mechanics
TD 172 - 196 Environmental pollution
878 - 894 Special types of pollution
TK 1 - 9971 Electrical engineering, esp. distribution of electric power, electric power circuit

In addition to books, videos and the scholarly articles to be found in the searchable online article databases, the Library retains a browsing collection of print subscriptions to ***EN****R* and a number of other general science/technology periodicals which support the Engineering program. Several engineering titles, for instance *Chemical & Engineering News* and *Environmental Science & Technology,* have been cancelled since 2010 due to excessive subscription costs and low usage.

Instructional Resources

The value of excellent research collections, whether online or in print, depends also on whether or not students are aware of and have the skills to use them. Experience shows that typical students are not aware of resources available, but instead are “looking around on the Internet” with often very limited success. To help alleviate this, librarians teach research skills.

Students typically have not been taught to use article databases in engineering courses. Many students enroll in the one credit hour Success in College and Life course, in which they receive instruction in doing academic research. Of course librarians staffing the Library Assistance desk answer informal student questions and provide one-on-one instruction.

Another way to help students gain skills is found in the varied “how to find relevant and credible information sources” guides created by librarians. Several online video tutorials have been created and the online Research Help module has been thoroughly redesigned. These can be found on the Library web page or directly from the YouTube channel (http://youtube.com/occclibrary).

Engineering faculty report that due to changes at the transfer institutions, the Introduction to Engineering course will be making a comeback, taking the place of longtime, 2 credit hour Engineering Professional Development course. The assignment to choose and research an engineering project in an assigned era, which was employed in the latter course, may be modified to be used in the new course. Future impacts on Library resources may include a need for more items on what engineers actually do, plus some more Visual Basic, graphing skills and items on

data handling.

Librarians are committed to providing the appropriate resources and helping students and faculty use them effectively. This may be more difficult in the new state budget crisis but, working with faculty, the Library will work to keep collections updated and useful.

e. The institution's curricular evaluation involves alumni, employers, and other external constituents who understand the relationship among the course of study, the currency of the curriculum, and the utility of the knowledge and skills gained.

OCCC has established specific curriculum patterns for transfer programs leading to the Associate in Arts (A.A.) or Associate in Science (A.S.) degrees. Describe program coordination efforts, partnerships and relationships with transfer institutions.

The OCCC Engineering Program provides very specific degree plans appropriate for students transferring to each engineering major at OU. OCCC also participates in the annual transfer conference held by OU each February.

The OCCC Engineering Program anticipates the creation of "two plus two agreements" with OSU in the near future based on discussions with the new CEAT administration. OSU has also recently established an annual transfer conference, in which OCCC participates regularly.

The OCCC Engineering Program has established "two plus two" agreements with UCO in both the Mechanical Engineering and Electrical Engineering options of their Engineering Physics degree.

f. The organization learns from the constituencies it serves and analyzes its capacity to serve their needs and expectations.

Changes are made as necessary each year after meeting with transfer specialists at OU and OSU. Students who have graduated from OCCC frequently return and suggest changes to course content and methods.

Changes adopted after these transfer conferences have included the addition or deletion of courses, along with changes in course sequencing, or even the addition of new engineering degree programs (e.g. OU Biomedical Engineering).

Changes adopted after discussions with former students have included emphasizing specific topics or introducing certain software packages (e.g. Solidworks, Excel, Visual Basic).

3. Minimum Productivity Indicators

The following are considered to be the minimum standards for degree program productivity (averaged over five years). Programs not meeting these standards may be identified for early review as low producing programs. Institutions will be notified of programs not meeting either one of the two standards listed below and other quantifiable measures in this section.

a. Number of degrees conferred (averaged over five years, minimum standard: AA/AS/AAS 5)

Engineering AS	
FY2011	27
FY2012	37
FY2013	33
FY2014	34
FY2015	52
5 Year Ave =	36.6

b. Number of majors enrolled (averaged over five years,minimum standard: AA/AS-25 AAS-17)

Engineering AS	
FY2011	675
FY2012	814
FY2013	933
FY2014	1,063
FY2015	1,330
5 Year Ave = 963	

4. Successful Course Completion

a. Report the successful completion rates of all major courses in the program.

Successful Completion is defined as receiving an A, B, C, D or S in a given Fiscal Year Term

Course #	FY2011	FY2012	FY2013	FY2014	FY2015
ENGR-2133	77.3%	70.1%	70.5%	71.1%	71.9%
ENGR-2143	86.4%	75.5%	88.1%	74.6%	79.2%
ENGR-2243	n/a	n/a	n/a	80.7%	76.8%
ENGR-2333	60.8%	43.2%	58.8%	52.2%	51.6%
ENGR-2343	60.0%	n/a	n/a	70.6%	75.0%
ENGR-2523	80.6%	70.8%	80.0%	78.7%	75.5%
ENGR-2613	70.0%	55.6%	65.8%	62.5%	53.2%

b. Report the successful completion rates of all general education courses in the program.

No courses in this program are considered general education courses.

c. Describe program student success initiatives.

The Engineering Lab was completed in about 2009 and for the first time, engineering students at OCCC were provided with a dedicated space. It also provides a focus for engineering and physics faculty, with all 5 full-time professors' offices located within. Over the last 5 years, STEP and TAP Tutors have been hired to help engineering students with homework and projects, providing up 100

hours of assistant per week, in addition to the 40 hours per week provided by two part-time Lab Assistants. The lab is staffed approximately 60 hours each week by Tutors and Lab Assistants.

The Engineering Club is sponsored by Engineering faculty as means of continuing the learning process outside of class, building camaraderie, and as a draw for declared engineering majors early in their academic careers to discover the people and opportunities that OCCC provides. Field trips are typically organized through the club.

Faculty also offer 1-hour special topics courses periodically to introduce students to real-world applications of theories taught in class and to provide an introduction to relevant hands-on skills such as welding or testing of concrete, soils, or metals.

Faculty also sponsor field-trips to local engineering facilities such as the OG&E Mustang Power Plant, the Vernon Campbell Water Treatment Plant, and Bergey Wind Power.

d. Describe results from success initiatives and future plans to increase student success based on success initiative results.

The Engineering Lab has provided students with the opportunity to experience with their hands the things they learn about in class. It also provides these students a place to study, help each other learn, and learn from student tutors who provide help at times when faculty may not be available.

The Engineering Club has been very strong in recent years, with attendance greater than 60 at times. The club brings transfer specialists from transfer institutions, speakers from industry, and sponsors fieldtrips each semester where students see the real application of engineering principles. The club also sponsors a variety of fund-raising and social events each semester that benefit a group of students who are typically introverted and reserved socially.

5. Other Quantitative Measures

a. The number of courses taught exclusively for the major program for each of the last five years and the size of classes for each program level listed below:

All engineering (ENGR) courses are currently 2000 level.

Engineering AS	FY2011	FY2012	FY2013	FY2014	FY2015
Number of Courses:	17	17	18	25	27
Average Class Size:	16.1	16.8	18.1	16.8	15.9

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

Engineering AS	FY2011	FY2012	FY2013	FY2014	FY2015
Student Credit Hours:	809	855	975	1,227	1,290

c. Direct instructional cost for the program for the review period.

Oklahoma City Community College (OCCC) offers online courses (computer based/ Internet) which allow students the freedom from attending regularly scheduled course meeting times while still earning college credit. Online courses are similar to traditional, on campus courses in that they have a regular class schedule, assignment due dates, and the expectation of student interaction. OCCC has committed resources for the creation of specialized resources for online students with the goal of increasing student success. These resources include a customized section of the OCCC website to assist them as they progress in their academic studies via distance and an orientation to the College's Learning Management System. We also provide virtual tutoring in the Math and Communication labs in addition to 24-7 tutor support through GradeResults to further customize and personalize online students' education. The cost of these initiatives and efforts totals $42,196. The cost of 24-7 technology support for student and faculty support those working within the learning management system is $70,500.00 (not including staff salaries 7:30-5:30 M-F).

Technology use in the classroom continues to expand to meet the needs of our students. 190 of our classrooms are equipped with permanent multimedia equipment with the availability of mobile carts to increase the number of high tech classrooms to 100%. The cost incurred with this multiyear effort was $1.55 Million. A faculty committee submitted a proposal for a classroom design that supports flexibility in classroom functionality including thin clients, a smaller folding presentation, and moveable furniture. This committee's proposal was adopted and supported by the Academic Affairs' Deans and President's Cabinet. Through a multi-department effort a total of $150,000 were spent to redesign three classrooms to support active learning and cooperative learning formats of instruction as well as a more traditional lecture style. Faculty members are continuing to utilize student response systems, SmartBoards, interactive projectors, tablets, and network computing devices in classrooms. OCCC continues to support the utilization of technology in the classroom so faculty can continue to engage students. The Center for Learning and Teaching offers multiple learning opportunities for faculty related to strategies for incorporating technology into instruction effectively as well as the use of the College's Learning Management System, Moodlerooms. The CLT team has strategically worked to meet the needs of our 163 full-time faculty as well as the 490 adjunct faculty members. They support them through organized workshops, online training modules, and individual faculty consultations conducted via phone,

Skype, email, or in person. The consultations focus on instructional strategies, course design/ redesign, assessment construction, selection and use of instructional technology, and aspects of using the College's LMS.

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

No courses in this program support the general education components of other programs.

e. A roster of faculty members including the number of full-time equivalent faculty in the specialized courses within the curriculum.

FTE = 3.3

Gregory Holland - Professor of Engineering
Gary Houlette - Professor of Physical Sciences

David Swyden - Adjunct Professor
Owen Dodd - Adjunct Professor
Olivair Dzune - Adjunct Professor
Tierney Harvey - Adjunct Professor
Aseem Nevrekar - Adjunct Professor

The number of adjunct professor teaching engineering courses varies from semester to semester.

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

Employers of OCCC Engineering Program graduates include: Johnson Controls, Oklahoma Department of Transportation, Schlumberger, Eaton Corporation, Sulzer, Weatherford International, Chesapeake, Bloom Electric, Comprehensive Production Services, Federal Aviation Administration, AT&T, Valero, Boeing, Nomac Drilling, Tinker Air Force Base, Department of Defense, and Bergey Wind Power.

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

When asked to rank how well the OCCC Engineering Program prepared them for continued education (1-10 scale), the respondents (n=70) gave an average score of 9.03.

Students who transfer to OU, OSU, or UCO will have a grade point average equal to or better than the grade point average in that institution.

Transfer Student Performance

Type of Student	**2011 GPA**	**2012 GPA**	**2013 GPA**	**2014 GPA**	**2015 GPA**
UCO					
OCCC Transfer	2.9	2.9	2.8	2.9	2.9
All Undergraduates	2.8	2.8	3.0	2.9	2.9
OSU					
OCCC Transfer	3.0	3.0	3.1	3.0	3.1
All Undergraduates	3.0	3.0	3.1	3.0	3.0

OU					
OCCC Transfer	3.2	3.2	3.2	3.0	2.9
All Undergraduates	3.1	3.1	3.0	3.2	3.2

Source: UCO, OSU and OU OCCC transfer students at OSU had a higher GPA than their native students. OCCC transfer students had the same grade point average as the native students at UCO. OCCC transfer student GPA at OU was lower than all OU undergraduates.

6. Duplication and Demand

a. Demand from students, taking into account the profiles of applicants, enrollment, completion data, and occupational data.

Demand from students is strong and is expected to remain strong for the foreseeable future. Engineering graduates continue to be in high demand with significant growth in jobs anticipated in the near future. Increased student enrollment to date has mostly been handled by increased classroom capacity. However, it is expected that a significant number of new sections will have to be offered soon to accommodate additional growth since classes are now approaching capacity.

b. Demand for students produced by the program, taking into account employer demands, demands for skills of graduates, and job placement data.

The Engineering program at OCCC is a university parallel program -- meaning students are expected to transfer to a 4-year institution and continue their studies upon graduation from OCCC. Students are not expected to enter the job-force directly after graduation. Approximately 80% of our students plan to transfer to the University of Oklahoma (OU) and OCCC Engineering graduates continue to be highly sought after by OU -- a dramatic shift from 10 years ago. Engineering advisors at OU often recommend that incoming students begin their career at OCCC -- not just because of the affordable cost and smaller class size, but because our students often out-perform those who complete their first two years at OU.

The recent change in engineering administration at OSU has resulted in an increased interest in recruiting transfer students from areas other than Tulsa. Administrators at OSU have approached us with the suggestion of developing 2+2 agreements. This is a dramatic change for an institution who has traditionally not been on the statewide transfer matrix and has required an intense review of courses prior to allowing transfer. The majority of courses provided by OCCC have already been established for transfer credit, but students transferring to OSU are often required to complete a probationary semester prior to being allowed into professional school. A 2+2 agreement would be a significant improvement for our students.

c. Demand for services or intellectual property of the program, including demands in the form of grants, contracts, or consulting.

Does not apply.

d. Indirect demands in the form of faculty and student contributions to the cultural life and well-being of the community.

The Engineering Club has sponsored food drives, volunteered for local middle-school job fairs, and raised money for ALS during their "ice-bucket challenge".

e. The process of program review should address meeting demands through alternative forms of delivery.

Online courses have been considered, but are not deemed appropriate for the content and rigors of the program.

We do offer a small number of "special topics" courses where students learn in more of a laboratory setting, but the opportunities are severely limited by the lack of full-time faculty to develop and teach those courses.

7. Effective Use of Resources

The resources used for a program determine, in part, the quality of the educational experiences offered and program outcomes. Resources include financial support (state funds, grants and contracts, private funds, student financial aid); library collections; facilities including laboratory and computer equipment; support services; appropriate use of technology in the instructional design and delivery processes; and the human resources of faculty and staff. The efficiency of resources may be measured by cost per student credit hour; faculty/student ratio; and other measures as appropriate. The effective use of resources should be a major concern in evaluating programs. The resources allocated to the program should reflect the program's priority consistent with the institution's mission statement and academic plan.

The Engineering Lab currently has only one computer classroom, housing 16 student computers, about half of which are bulky machines that have been handed down from the IT division and the other half of which are bulky machines at least 5 or 6 years old. With the return of the ENGR 1113 Introduction to Engineering and the programming component of that course, it would be desirable to have at least 25-30 machines in a classroom. The Engineering Lab does have about 8 computers in the common area, including two higher-quality machines capable of running SOLIDWORKS and other processor-intensive CADD software. The common area also houses a Genius smart-board that students are allowed to use.

The Engineering Lab has a variety of laboratory equipment available for hands-on educational activities:

- MIG, TIG, and stick welders.
- Plasma-cutter.
- Assorted power-tools, including drills, saws, and grinders.
- Assorted hand-tools.
- Concrete tools and a concrete compression tester.
- A mill and lathe combo unit.
- Assorted equipment for materials analysis, including tensile testers, hardness testers, a grinder/polisher, a metallurgical microscope, an atomic force microscope (AFM), and a scanning tunneling microscope (STM).
- Assorted electronic equipment, including breadboards and electronic component cabinets.
- Two 3-D printers.

Until this last year, all engineering courses were taught by two full-time faculty and a single, regular, adjunct professor (a former OCCC student). Over the last year, we have added a total of four new adjunct faculty at various times. This creates a major challenge to the goal of providing the consistency in the quality of instruction that has fueled the growth of the program. A third full-time faculty, perhaps with a background in computer or electrical engineering is desperately needed to help maintain the sustained growth that the Engineering Program has seen in the last five years.

IV. Program Review Recommendations

This section is a description of recommendations that have been made as a result of the review and of actions that are planned to implement these recommendations. Recommendations should be clearly linked and supported by the information and analyses that were articulated in the previous sections and should contain a realistic strategy for implementation of any changes.

A. Describe the strengths of the program identified through this review.

Two of the greatest strengths of the program are the consistency and the quality of the courses. This has been possible because very few courses have been handled by a revolving adjunct pool and have been handled almost exclusively by full-time faculty. The size of the program allows for most ENGR courses to be taught two or more times per year, which contributes greatly to the consistency and quality of the instruction.

B. Describe the concerns regarding the program that have been identified through this review.

The dramatic growth of the program challenges our ability to continue providing the very consistency and quality of instruction that has led to its success. More full-time faculty are needed.

2+2 program agreements are needed with OU and OSU if possible.

Replacement computers are needed for the engineering computer classroom (1R1).

The Engineering Lab is frequently at capacity, both in the classrooms and in the common area. More space will be needed to allow continued growth.

C. Develop a list of recommendations for action that addresses each of the identified concerns and identify planned actions to implement recommendations.

Hire another full-time faculty with a background in computer and electrical engineering.

Pursue 2+2 transfer agreements with OU and OSU.

Replace computers in 1R1 with newer models.

Consider relocating nursing faculty in the Transportation Technology Center to the old Aquatic Center or vacant Child Development Center and allow the Engineering Program (and other MEPS programs) to expand into the offices and classrooms vacated by the Nursing Program.

D. Provide institutional recommendations as the result of the program review and planned actions to implement recommendations.

The concerns expressed by the engineering program faculty are ultimately the result of their own success. In the last five years the program has grown in enrollment, graduate numbers, and reputation. The program's quality has put it on the cusp of explosive growth. That growth is bounded by the current lack of fiscal resources being experienced in all of higher education in Oklahoma.

Both of the recommendations made in this Review are reasonable and should be attempted. Contingent upon funding they will be among the highest, if not the highest, priority of the division of mathematics, engineering and physical science. The continued health and possible expansion of the engineering program will directly, and positively impact the mathematics and physics programs since engineering students share their core course work with math and physics majors.

Additionally engineering majors often serve as physics and mathematics tutors. The division dean will submit strategic initiatives related to both of these recommendations.

Appendix

Program Curriculum

Program Requirements

Minimum Required Hours 62

Major Courses		
Prefix & Number	Course Title	Credit Hours
ENGR 2002	Professional Development (C)	2
ENGR 2243	Statics (C) --OR	
ENGR 2133	Rigid Body Mechanics (C)	3
	and 6 hours of approved major electives selected from:	
	ENGR 1000 (C); ENGR 1213 (C); ENGR 2103 (C);	
	ENGR 2143 (C); ENGR 2200 (C); ENGR 2303 (C);	
	ENGR 2313 (C); ENGR 2333 (C); ENGR 2343 (C);	
	ENGR 2523 (C); or ENGR 2616 (C).	6

General Education Courses		
Prefix & Number	Course Title	Credit Hours
ENGL 1113	English Composition I	3
ENGL 1213	English Composition II	3
HIST 1483	U.S. History to the Civil War --OR	
HIST 1493	U.S. History to Since the Civil War	3
POLSC 1113	American Federal Government	3
SOC 1113	Introduction to Sociology --OR	
PSY 1113	Introduction to Psychology	3
MATH 2014	Calculus and Analytic Geometry I	4
MATH 2214	Calculus and Analytic Geometry II	4
PHYS 2014	Engineering Physics I	4
PHYS 2114	Engineering Physics II	4
HUM	Humanities Elective	6

Support Courses		
Prefix & Number	Course Title	Credit Hours
MATH 2314	Calculus and Analytic Geometry III	4
CHEM 1115	General Chemistry I --OR	
CHEM 1415	Chemistry for Engineers	4
	4-6 hours of approved majors electives selected from	4-6
	GEOL 1114; PHYS 2223; MATH 2013; MATH 2413;	
	CAT 1214; CS 1143; CS 2163; CS 2363; CHEM 1215;	
	CHEM 2114; CHEM 2122; CHEM 2124; ENGR 1213 (C);	
	ENGR 2103 (C); ENGR 2143 (C); ENGR 2313 (C);	
	ENGR 2333 (C); ENGR 2343 (C); ENGR 2523 (C); --OR	
	ENGR 2613 (C).	

Life Skills Courses		
Prefix & Number	Course Title	Credit Hours
SCL 1001	Success in College and Life	1