Bakersfield College
Program Review – Annual Update 2015

I. Program Information:
Program Name:

Program Type: ☒ Instructional   ☐ Student Affairs   ☐ Administrative Service

> **_Bakersfield College Mission_**: Bakersfield College provides opportunities for students from diverse economic, cultural, and educational backgrounds to attain Associate and Baccalaureate degrees and certificates, workplace skills, and preparation for transfer. Our rigorous and supportive learning environment fosters students' abilities to think critically, communicate effectively, and demonstrate competencies and skills in order to engage productively in their communities and the world.

Describe how the program supports the Bakersfield College Mission:

The Engineering program supports the BC mission through *preparation for transfer*. A Baccalaureate in an engineering discipline is a valuable asset nationally and across economic sectors while an Associate degree opens very few pathways into the work force, thus few BC students obtain an AS on the way to their BS. The Engineering curriculum is designed to be provide multiple pathways for transfer, rather than being a "feeder" to a particular university. This is accomplished by aligning its courses to match statewide C-ID descriptors, improving the odds of successful transfer to BS-granting programs after 2-3 years of general education and engineering specific course work at BC.

Program Mission Statement:

Engineering is an instructional program that strives to offer effective and student-centered instruction in engineering, being sensitive to the diversity of our students, their educational needs, and career goals.

II. Progress on Program Goals:
A. List the program's current goals. For each goal (minimum of 2 goals), discuss progress and changes. If the program is addressing more than two (2) goals, please duplicate this section.

Program Goal	Which institutional goals from the Bakersfield College Strategic Plan will be advanced upon completion of this goal? (select all that apply)	Progress on goal achievement (choose one)	Comments
1. Establish a Creative Design Center and develop a cohort program with basic skills to engage students in technological skills.	☒ 1: Student Learning ☐ 2: Student Progression and Completion ☐ 3: Facilities ☐ 4: Oversight and Accountability ☐ 5: Leadership and Engagement	☒ Completed: _____ (Date) ☒ Revised: 9/21/2015 (Date) ☐ Ongoing: _____ (Date)	The Creative Design Center is complete and development of a cohort program has been forgone in favor of implementing specific modules (laser-cutting, 3D-printing) into various courses within Engineering and Industrial Technology (e.g. ENGR B47 and INDT B12).
2. Continue to address the gaps in core indicators, particularly the gap in female enrollment.	☐ 1: Student Learning ☐ 2: Student Progression and Completion ☐ 3: Facilities ☐ 4: Oversight and Accountability ☒ 5: Leadership and Engagement	☐ Completed: _____ (Date) ☐ Revised: _____ (Date) ☒ Ongoing: 9/21/2015 (Date)	The primary engineering faculty member attended multiple sessions of the "STEM Success for Women Telesummit" <http://www.iwitts.org/stem-telesummit#.Vf-aQnuFm9M> in April. According to one session, the most effective strategy for improving female (and specifically ethnic minority female) enrollment appears to be a comprehensive approach which starts with outreach at the K-12 level, direct contact (phone and email) to admitted students, an open house event, a summer bridge program and student support services (tutoring specifically) after courses begin. No comprehensive plan has yet been developed within the Engineering program at BC and will likely require a significant time commitment from multiple faculty members. Organization will continue this year and implementation will start with outreach to and recruitment from the area High Schools.

3. Improve clearly communicated pathways for engineering students by strengthening communication with Project Lead the Way (PLTW) programs at the high schools and middle schools.	☐ 1: Student Learning ☒ 2: Student Progression and Completion ☐ 3: Facilities ☐ 4: Oversight and Accountability ☒ 5: Leadership and Engagement	☐ Completed: _____ (Date) ☐ Revised: _____ (Date) ☒ Ongoing: 9/21/2015 (Date)	Engagement of PLTW students was improved this year by the creation of an Unmanned Air Vehicle Summer Camp for PLTW middle school students. Additionally, funding from Chevron provided scholarships for 3 incoming STEM students, prioritizing PLTW participants. Though KCCD's database does not track PLTW students, Chevron predicts an increase from five to thirteen incoming Engineering students from the PLTW program.
4. Develop a summer research program for engineering majors in collaboration with CSUB.	☐ 1: Student Learning ☒ 2: Student Progression and Completion ☐ 3: Facilities ☐ 4: Oversight and Accountability ☐ 5: Leadership and Engagement	☐ Completed: _____ (Date) ☒ Revised: 9/21/2015 (Date) ☒ Ongoing: 9/21/2015 (Date)	The initial plan for this summer research collaboration was contingent upon funding from the Department of Education (DOE) for development of an Advanced Technical Education center. DOE Funding was not received so implementing this program will be considered once other funding sources are found.

B. List new or revised goals (if applicable)
Not applicable

III. Trend Data Analysis:
Highlight *any significant changes* in the following metrics and discuss what such changes mean to your program.
A. Changes in student demographics (gender, age and ethnicity).
There are no major changes in demographics of the Engineering program. Over the last five years, each ethnicity has trended closer to the college-wide enrollment numbers and as of 2014-15, no ethnic group varies more than 2 percentage points from college-wide numbers. Unfortunately, female enrollment is still quite low (13% in Engineering vs. 54% college-wide). This is fairly common in engineering programs (though not necessarily to this extent) and warrants continued attention (as indicated in the program "Goals" section).
B. Changes in enrollment (headcount, sections, course enrollment and productivity).
The Engineering program has grown drastically last year with an 18% increase in unduplicated head count (compared to 1% growth college-wide). The bulk of this change appears to be in the "19 & Younger" age category, growing from 33% to 41% while all other age groups remained fairly constant.

C. Success and retention for face-to-face, as well as online/distance courses.
Currently all Engineering courses are taught face-to-face and the success and retention numbers have remained fairly constant over the last five years. The 2014-15 numbers (93% retention and 84% success) continue to be above college-wide numbers.

D. Changes in the achievement gap and disproportionate impact (Equity).
Retention is nearly equal across all ethnic groups, but success numbers show stratification. Asian, Hispanic and White success rates range from 74-84%, relatively close to the program average success rate. African American success is currently at 62%, above the college-wide success rate but below the program rate. The small number of African American students in the program (8 of 280) suggest this number could be highly variable, allowing for the possibility of rapid improvement with improvement.

E. Other program-specific data that reflects significant changes *(please specify or attach).* All Student Affairs and Administrative Services should respond.
The number of students with Engineering as a declared major has undergone a rapid increase of 72% in the last five years. In the last two years alone, the numbers of declared majors has increased 42%. This rapid growth is likely to lead to increased enrollment in the near future (already seen in the *Introduction to Engineering* course, ENGR B47, which hit a five-year high in enrollment last year). As student progress through the Math and Physics prerequisites over the coming year, 2015-16 and 2016-17 enrollment in the program could reasonably be expect to increase by a significant amount.

IV. Program Assessment (focus on most recent year):

A. How did your outcomes assessment results inform your program planning? Use bullet points to organize your response.
- In ENGR B47 student performance on group reports and presentations was poor. The course schedule was revised to include instruction on technical writing and oral presentation expectations prior to the first group group
- In ENGR B36, assessing SLOs based on only three midterm exams and a final was difficult. The following engineering mechanics course (ENGR B37) was redesigned to have four exams and a final, allowing for easier assessment of a wider range of subject matter. The ENGR B36 course for Fall 2015 was redesigned to follow a similar pattern
- In ENGR B36, student feedback suggested that homework problems were often skipped because they weren't collected and graded. To encourage (incentivize) students to spend more time working homework problems (the best way to improve engineering problem-solving skills) the points distributions in ENGR B17, ENGR B37 and the ENGR B36 in the following year were all amended. Homework is now collected and a significant (up to 20%) portion of the course grade is based on performance

B. How did your outcomes assessment results inform your resource requests? The results should support and justify resource requests.
A significant amount of in-class time in ENGR B47 and ENGR B19C is dedicated to in-class group work and problem-solving that requires the use of computers with specific software (e.g. *Solidworks* computer-aided drafting, *Excel* spreadsheet editor and *Dev C++* compiler). Currently, 14 laptops are available in SE-45 for distribution to students, while class size is now at 40-48 for each of these courses. Ideally, each student would have his or her own device to work on as the actual process of inputting, writing code or building 3D solid models is far better for comprehension than merely observing another student performing these operations. Because of this hardware need, an ISIT technology request for further laptops has been included.

Additionally, with growing class size, students in ENGR B36, ENGR B47, ENGR B17 and ENGR B19C are limited to seating locations in the back and sides of the room. These areas have a limited view of the two displays (47" monitors placed on opposite sides of the white board), leading to difficulty follow lecture material. One potential solution is a portable, short-throw projector station either (A) at the front of the room and projecting onto the white board or (B) stationed in the southeast corner of the room, projecting onto a pull-down vinyl screen. Details of this potential solution are provided in an attached ISIT technology request.

Lastly, a major module within the ENGR B47 class is a design project based on building solid models of spinning tops in a 3-D modelling environment,

Solidworks. A *Solidworks* license cannot be acquired wirelessly so students must be connected via Ethernet cable. Currently there are only 8 Ethernet ports in the room, meaning a full lab of 24 students can have no more than 33% of the students working productively at a given time. An ISIT technology request has been attached documenting the need for either (A) splitters and long cables or (B) installation of new ports near the desk space.

C. How do course level student learning outcomes align with program learning outcomes? Instructional programs can combine questions C and D for one response (SLO/PLO/ILO).
See answer to D

D. How do the program learning outcomes or Administrative Unit Outcomes align with Institutional Learning Outcomes? All Student Affairs and Administrative Services should respond.
All ENGR course SLOs have been mapped to PLOs and ILOs. Every course maps very clearly to ILOs 1-3 (Think Critically, Communicate Effectively, Demonstrate Competency), but few map to number 4: "Engage Productively in All Levels of Society". During course revision, restructuring could be done to better address this desired outcome.

E. Describe *any significant changes* in your program's strengths since last year.
    Part of the ENGR B17 and the entirety of the ENGR B24 course take place in the computer labs in MS-9 and MS-10. Computers were replaced in Summer 2015 and this change is expected to lead to improved in-class efficiency as boot times and freezes should be significantly reduced and general responsiveness to the graphics-intensive programs (such as *Solidworks* and *AutoCAD*) should improve. At this point, evaluation of the improved hardware is still in progress.

F. Describe *any significant changes* in your program's weaknesses since last year.
    One weakness from 2014-15 was an inability to offer enough lab sections to accommodate students in ENGR B45 and ENGR B17. As of Summer 2015 a new adjunct has been hired, allowing a second section of B45 to be offered in the Fall 2015. The possibility of offering a second section of B17 in the Spring 2016 semester is still under consideration.

G. If applicable, describe any unplanned events that affected your program.
    Not applicable

V. Assess Your Program's Resource Needs: To request resources (staff, faculty, technology, equipment, budget, and facilities), please fill out the appropriate form. https://committees.kccd.edu/bc/committee/programreview

A. Human Resources and Professional Development:
    1. If you are requesting any additional positions, explain briefly how the additional positions will contribute to increased student success. Include upcoming retirements or open positions that need to be filled.
        Recruiting adjunct faculty in engineering can be challenging and creates instability in the program. Having additional faculty within in this area will support the program growth we are currently experiencing and the expected increased transfer pipeline to CSUB's relatively new engineering programs. CSUB was just awarded another Title V grant for their engineering degree programs in which BC will partner. This faculty position will provide the needed programmatic support for grant work and increased curricular alignment and articulation, thus ensuring the success of the engineering program and student success within the program.
    2. Professional Development:
        a. Describe briefly the effectiveness of the professional development your program has been engaged in (either providing or attending) during the last year, focusing on how it contributed to student success.
            The primary engineering faculty attended a "Summer Engineering Teaching Institute" at Pierce College in Summer 2015. This workshop provided hardware (a Surface Pro 3 tablet with digital stylus) as well as software recommendations and tutorials for creating and posting lecture material online. In the future this material and knowledge is intended for use in developing online lecture materials for ENGR B36 that would allow for concurrent sections to take place on the Bakersfield campus as well as the Delano campus.

b. What professional development opportunities and contributions can your program make to the college in the future?
Engineering faculty will be providing curricular development support for the Materials Science course in the Bachelor of Science in Industrial Automation degree.

B. Facilities:
1. How have facilities' maintenance, repair or updating affected your program in the past year as it relates to student success?
   Not applicable
2. How will your Facilities Request for next year contribute to student success?
   Not applicable

C. Technology and Equipment:
1. Understanding that some programs teach in multiple classrooms, how has new, repurposed or existing technology or equipment affected your program in the past year as it relates to student success?
   As noted in Section IV-E, the update to the computers in MS-9 and MS-10 is expected to make student problem-solving and project completion in ENGR B24 and ENGR B19C more efficient. Currently the new computers have only been in use for a matter of weeks but preliminary feedback is that the software is more responsive.
2. How will your new or repurposed classroom, office technology and/or equipment request contribute to student success?
   An increase in the number of laptops available for student use in SE-45 will allow for improved comprehension of subject matter in ENGR B47 and ENGR B19C by allowing more students a hands-on experience with critical software like Microsoft Excel, Dev C++ and Solidworks, rather than splitting screen time among students in groups of 3-4.
3. Discuss the effectiveness of technology used in your area to meet college strategic goals.
   The software packages chosen for the engineering courses are industry-standard programs. Becoming proficient with these software packages while in class aligns with the ILO: "demonstrate competency… with job-related skills."

D. Budget: Explain how your budget justifications will contribute to increased student success for your program.

VI. Conclusions and Findings:
Present any conclusions and findings about the program. This is an opportunity to provide a brief abstract/synopsis of your program's current circumstances and needs.
The Engineering program has experienced recent growth while maintaining its record of retention and success. In the coming years, attention will have to be paid to the continued growth of the program which may necessitate expanding course offerings that had traditionally been available once per year. Additionally, maintaining articulation pathways from High Schools to the BC Engineering program and from BC to four-year institutions will require attention. As four-year engineering programs become impacted, transfer becomes more difficult and alternative institutions must be sought. Making sure there is a robust and diverse set of transfer pathways is vital to the long-term health of the program.

VII. Forms Checklist (place a checkmark beside the forms listed below that are submitted as part of the Annual Update):

☒ Best Practices Form **(Required)**
☒ Curricular Review Form **(Instructional Programs Required)**
☐ Certificate Form **(CTE Programs Required)**
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☐ Faculty Request Form ☐ Classified Request Form ☐ Budget Form
☐ Professional Development Form ☒ ISIT Form ☐ Facilities Form (Includes Equipment)

☐ Other: _____