**Bakersfield College**

**Comprehensive Program Review**

**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:

**The Engineering Program strives to prepare students for transfer to BS-granting programs across the state of California and beyond. While the study of Engineering does help generate basic skills (computer-drafting, spreadsheet competency, public speaking skills, report-writing competency) and foster critical thinking (complex problem-solving, analyzing assumptions, eliminating ambiguity) it’s primary purpose is to provide coursework that makes its students appealing transfer candidates to BS-grating programs. While most of the coursework has rigorous limitations on enrollment (pre-requisites set by state C-ID criteria) it is the goal of the faculty and staff to use counseling and outreach to make this program accessible to all interested students, regardless of age, socioeconomic status, gender, ethnicity or previous educational background.**

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| ***Instructional Programs only:***   1. List the degrees and Certificates of Achievement the program offers: **Engineering (AS)** 2. If your program offers both an A.A. and an A.S. degree in the same subject, please explain the rationale for offering both. **N/A** 3. If your program offers a local degree in addition to the ADT degree, please explain the rationale for offering both. **N/A** |

**II. Progress on Program Goals, Future Goals, and Action Plans:**

1. 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 goals, please duplicate this section.

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| **Current Program Goals** | **Which institutional goals from the 2015-2018 Strategic Directions for Bakersfield College will be advanced upon completion of this goal? (select all that apply)** | **Progress on goal achievement**  **(choose one)** | **Comments** |
| 1. **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: **9/21/206** (Date) | **Currently, most of the outreach for the Engineering program takes place in student organization activities (such as the “Design Challenge” by the *Engineers Club* or “Noche De Ciencias” by the *HOPES Club*) but with the addition of a second, full-time faculty member in the program it is now possible to expand faculty involvement to local high schools to help recruit underserved populations into the program.** |
| 2. **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:  **9/21/2016** (Date) | **Jason, I’m not sure what to say about this one. Did we host the program again? And, if so, do we have numbers like last year? It was listed as an “ongoing” goal, but frankly, I don’t know much about PLTW. Is it time to mark it as “Completed”.** |

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| 3. **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: \_\_\_\_\_\_\_\_\_\_ (Date)  Ongoing:  **9/21/2016** (Date) | **Faculty from BC and CSUB are collaborating on another grant proposal for Department of Education funding for development of an “Advanced Technical Education Center”. If received this funding will allow for the creation of the summer program.** |

1. List the program’s goals for the next three years. Ensure that stated goals are specific and measurable. State how each program goal supports the College’s strategic goals. Each program must include an action plan.

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| **Future Goals** | **Which institutional goals from the 2015-2018 Strategic Directions for Bakersfield College will be advanced upon completion of this goal? (select all that apply)** | **Action Plan** | **Timeline for Completion** | **Lead person for this goal** |
| 1. **N/A  (ongoing goals have priority)** | 1: Student Learning  2: Student Progression and Completion  3: Facilities  4: Oversight and Accountability  5: Leadership and Engagement |  |  |  |
| 2. | 1: Student Learning  2: Student Progression and Completion  3: Facilities  4: Oversight and Accountability  5: Leadership and Engagement |  |  |  |

**III. Trend Data Analysis:**

Review the data provided by Institutional Research. Provide an analysis of program data throughout the last three years, including:

1. Changes in student demographics (gender, age and ethnicity).   
   **While the demographics for age and ethnicity are fairly stable and line up with college-wide figures, the continuing issue gender balance with the Engineering student population. BC is certainly not alone in this difficulty, but fairly-stable 15:85 ratio of female:male students has only changed by a single percentage point in the last five years. As stated in our “Goals” section, there is ongoing attention to this problem. While there is no “silver bullet” to address this problem, the increase in full-time faculty within the department should provide more person-hours of availability for the development and implementation of specific recruitment programs.**
2. Changes in enrollment (headcount, sections, course enrollment, and productivity).  
   **There is a *very* clear trend in enrollment over the last few years that is *growth*. Head count continues to rise, showing a 22% increase last year, which followed a 16% increase the following year. The number of sections offered jumped 29% (from 17 to 22 sections, following a fairly stable four-year period prior) to match the increase in student demand. Census Day enrollments show a comparable 30% increase last year as well. Productivity has dropped slighting (about 3%) as the increase in sections offered occasionally leads to half-full classes.**
3. Changes in achievement gap and disproportionate impact.  
   **Retention and Success data closely mirror last year. Engineering students “beat” the college-wide averages across the board, but there remains concern over the relatively low Success rate for African American students. Again, the low enrollment number (7 of 342) make this number highly variable and offers the potential for great improvement.**
4. Success and retention for face-to-face as well as online/distance courses.  
   **N/A (our program currently offers no Distance Ed courses.**
5. Degrees and certificates awarded (three-year trend data for each degree and/or certificate awarded).   
   **The trend of few degrees awarded continues. Again, our goal is transfer to BS-granting programs because of the limited utility of an AS degree in Engineering. While transfer numbers are not officially tracked currently, the continued state-wide movement toward a transfer certificate and AD-T-like award (Engineering does not match the criteria for an official AD-T degree because it is a high-unit major) in Engineering will hopefully change this in the future. Counting these awards or certificates in the future would be a valuable measure of success in a way that counting AS degree attainment is not.**
6. Other program-specific data (please specify or attach).  
   **The success rate in Engineering (82% vs 71% college-wide) is noteworthy, but probably due to the high-achieving students that come in to the program right out of high school. Though Engineering faculty certainly take pride in their work, they also are the beneficiaries of some of the most motivated students on campus. Also of noteworthy is the exception rate of Ed Plan completion and full matriculation. The Engineering program reached five-year highs of 97% Ed Plan completion and 96% full matriculation. The presence of an Engineering-specific counselor is a *huge* advantage in this feat, as the general counselors would likely not be familiar with the careful planning it takes to help a student navigate through the “gateway” Math and Physics courses that get students into the Engineering courses in a reasonable timeframe.**
7. List degrees and certificates awarded (three-year trend data for each degree and certificate awarded). Include targets (goal numbers) for the next three years.

**Though it may seem odd to list “0” as a goal for certificates awarded, Engineering students typically only receive AS degrees because they have been at BC for longer than the 2-3 years it takes to develop a transfer-worthy transcript. Students who change majors or fail classes and repeat end up staying long enough to meet GE requirements for the certificate, but generally the Engineering program wants its students to do well and move on prior to meeting GE requirement as they still have a significant amount of coursework to navigate after transfer.**

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| Full Name of Degree or Certificate | 2011- 2012 | 2012- 2013 | 2013- 2014 | 2014- 2015 | 2015- 2016 | 2016- 2017 |
| **Engineering Technology** |  |  |  | **1** |  |  |
| **Engineering, General** |  | **6** | **5** | **3** | **5** | **0** |

**IV. Program Assessment:**

Use attached **Assessment Report Form Comprehensive Tab**

1. Discuss your program’s strengths.  
   **The support programs available (such as MESA, the Engineering-specific counselor and STEM grant funding) allow Engineering students a number of “safety nets” and supplemental activities that students in other programs might not have access to. Supports from outside professional organizations (such as ASCE hosting on-campus events and tours set up through IEEE) has been valuable as well. One *could* consider the small size of the program as a strength as well in that changes and updates can happen rapidly and there are fewer channels of communication that can break down.**
2. Discuss your program’s weaknesses.  
   **The most prominent (and perhaps obvious) weakness of the program is the inexperience of its primary instructors. At the time of this report, one of the main ENGR faculty members has been in the program for just over two years and the other for just about two months. Though there is a wealth of experience in the PHYS instructors who have taught ENGR courses in the past and there has been assistance from former ENGR instructors who have moved on to other positions, but there will always be a struggle when the majority of program courses are taught by those who are very new to the program. Additionally, the small size of the program *could* be viewed as a weakness. While programs like MATH or ENGL work to develop fundamental skills, many of the ENGR courses (ENGR B45 *Properties of Materials* lab, ENGR B24 *Engineering Graphics*) have a clear work-preparation component. Students are learning procedures and software packages that directly translate into job skills. With a limited number of faculty members, it is difficult to make sure that students have a broad perspective. To counter this potential problem, numerous outside sources (guest lecturers, panel discussions, informal mentoring) are engaged with the hope of rounding out students’ experience with engineering professionals.**
3. *If applicable,* describe any unplanned events that affected your program.  
   **N/A**

**V. Resource Analysis:** To request resources (staff, faculty, technology, equipment, budget, and facilities), please fill out the appropriate form. <https://committees.kccd.edu/bc/committee/programreview>

1. Human Resources and Professional Development:
2. 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.  
   **N/A**
3. Professional Development:
4. 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.  
   **In addition to the numerous on-campus activities offered during FLEX week, the primary method of faculty professional development has been continued presence at the biannual *Engineering Liaison Council* (ELC) meetings. These meetings facilitate discussion between Engineering faculty from four-year (BS degree-granting) institutions and the community colleges with Engineering transfer programs. Attendance keeps faculty up to date on potential changes in C-IDs, the movement towards a transfer degree and transfer certificate, best practices in teaching developed at other programs and potential grant collaborations.**
5. What professional development opportunities and contributions can your program make to the college in the future?  
   **Continued participation in ELC is the primary focus, but the department will continue to seek out opportunities to coordinate with other programs that have closed the “gender gap” in Engineering (example: last year a teleconference session on Cal-Poly Pomona’s success in recruiting and supporting female students into Engineering programs was valuable and future updates on their success would be valuable).**
6. Facilities:
7. How have facilities’ maintenance, repair or updating affected your program in the past year as it relates to student success?  
   **The variance in HVAC output has caused student feedback on more than one occasion, but there has not been any indication it negatively effects student success.**
8. How will your Facilities Request for next year contribute to student success?  
   **N/A - We will not be making a facilities request this year.**

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?  
   **There is an ongoing struggle to provide software training in particular classes because of the limited availability of computer labs in the MS building and the hardware limitations and the limited availability of laptops in SE-45. For example, in ENGR B47, a module on computer-aided design used to be taught with the SolidWorks program, but has been changed to make use of a free, browser-based program called OnShape. While this free program *does* meet the limited needs of the B47 course, it is sub-optimal because SolidWorks (an industry-standard CAD package) is the type of program students would use on the job site and has a number of analysis features that OnShape lacks (which is designed for hobbyists, rather than working engineers). Additionally, slow network connections caused a room change for the ENGR B19C course. Slow connection speeds and startup speeds on the laptops cost significant amounts of lab time and it was determined that moving to a full computer lab was necessary.**
2. How will your new or repurposed classroom, office technology and/or equipment request contribute to student success?  
   **• If an Engineering-specific computer lab can be provided, software usage could be standardized and optimized for several courses (ENGR B47, B24, B19C). Slow load times and license acquisition times (associated with wifi connections) could be eliminated and class time would become more efficient. The change back to the industry-standard SolidWorks for 3D modeling would improve student skill development, making them more desirable to local firms for part time positions and internships.  
   • If an Engineering-specific computer lab cannot be provided, a short-term solution would be increasing the number of laptops available in SE-45. Current 12 functioning laptops are available for 24-30 students and having enough devices for each student is critical. It is very difficult to learn any program (let alone the complex and non-user-friendly ones such as MS Excel and SolidWorks) by looking over a partners shoulder, rather than controlling the mouse and keyboard oneself.  
   • If ENGR B45 lab equipment can be upgraded (furnace used for heat treatment and UTM used for compression, tension and flexure testing) students would have more repeatable data and improve their familiarity with the type of equipment they could expect to see in industry.**
3. Discuss the effectiveness of technology used in your area to meet college strategic goals.  
   **In addition to software usage for many ENGR courses (B47, B24, B19C), there are several other courses that makes use of technological tools to improve student learning. For example, the ENGR B47 course makes use of the 3D printers in the Creative Design Center to reinforce the principles of measurement and iteration in the design process. The ENGR B36 and B17 courses, though lectures, make use of several graphical and online tools to demonstrate principles that are difficult to demonstrate on a 2D whiteboard. For example: shear and moment diagrams in B36 can be time consuming and counter-intuitive so an online tool is demonstrated for building graphical solutions. In B17, one can never “see” electrons moving around, but with online simulators, one can virtually “build” the circuits we analyze in class. This helps to both (1) build the engineering intuition that is difficult to do with only pencil and paper and (2) check one’s paper-and-pencil solutions to verify that the proper procedure has been followed. In ENGR B45, visualizing atomic, 3D crystals is quite difficult so use of a rotating 3D model provides a perspective that 2D drawing on a whiteboard or textbook page cannot capture. Additionally, time-dependent graphics (like “slips” in crystals or crack-propagation in “fatigue” testing) cannot be shown on a static page and require moving images displayed via projector. Lastly, Moodle, the current course management software, has been heavily utilized for distributing student grades, lecture slides, sample solutions to practice problems and occasionally supplemental material that isn’t presented during lecture.**

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

**VII. Faculty and Staff Engagement:**

1. Discuss how program members have engaged in institutional efforts such as college committees, presentations, and departmental activities.  
   **The primary ENGR faculty member is currently serving on the Curriculum Committee for his second year. He regularly participates in department-wide functions, such as the SPE Engineering Day, hosted by BC last February.**
2. Instruction Only: Discuss how adjunct faculty are included in departmental training, discussions and decision-making.  
   **Because the program is fairly small, new adjuncts typically have several face-to-face meetings with a primary instructor, prior to teaching a course. They are given access to lecture slides, supplemental material and lab equipment in order to prepare for the given assignment. For the many adjuncts that have taught courses multiple times, minimal training is required. Departmental information or decision-making is sometimes handled directly by the department chair and sometimes facilitated by the full-time instructors, depending on availability and content.**

**VIII. 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 is in an interesting set of circumstances because of the rapid growth in enrollment and the extensive change-over in faculty over the last three years. It is certainly an exciting time as decisions on course content and lab equipment updates will be made that will effect student performance. Guidance at the department and area levels have been crucial to keeping the program moving in the right direction and access to adjunct and experienced non-ENGR faculty have played a key role as well. In terms of physical space, the recent STEM grant and the potential for improved facilities with the impending bond measure provide the possibility of continued expansion of the program (in terms of size and capabilities). The new faculty hire provides expertise in petroleum engineering that could yield new course content and professional networking opportunities for students. The biggest concern at the moment is the difficulty in navigating the many obstacles that are on the horizon (funding for new lab equipment, balancing technology requests with the needs of other departments, proper documentation at the course level to satisfy department and college needs for accreditation) all while developing form novice instructors into contributing members of the BC faculty. Going forward, relying on adjuncts, industry partners and previous ENGR instructors will be critical.**