

# Bakersfield College

## Program Review – Annual Update

### I. Program Information:

Program Name: Engineering

Program Type:  Instructional  Non-Instructional

Program Mission Statement:

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

Program Description: Describe how the program supports the [Bakersfield College Mission](#).

The Engineering program supports the institutional mission by providing rigorous academic coursework for transfer and relevant technical skills to build employment capacity. Since engineering is a high unit major, students are best served completing the lower division preparation courses at Bakersfield College and continuing in transfer to a four year university, rather than completing the general education required for an A. S. degree. Engineering students who are placed below first semester calculus (~42%) will typically be at the college for more than two years. In such cases, students are encouraged to seek a local degree and develop a skill set through technology coursework, such as AutoCAD, SolidWorks, manufacturing, and electronics.

### II. Program Assessment (focus on most recent year):

A. How did your outcomes assessment results inform your program planning?

Effective incorporation of robotics into the curriculum remains a significant element of program planning and presents challenges to student learning. Several hardware/software platforms (Arduino, Pololu, etc.) were used to provide a more intuitive learning environment for the students with limited success. Continued improvement in meeting this goal will be pursued as technology advances becomes available in this area.

Solidworks was successfully integrated into the Engineering Graphics course this last year and improved student success in this particular course. This software is widely used in industry and provided another avenue of visualization for the students.

B. How did your outcomes assessment results inform your resource requests?

Much of the software/hardware used in the robotics and graphics are supported by the computer technology provided in MS9. Thus, a resource request for computers replacements in MS9 has been submitted. The computer replacement in this particular lab can be supported with funding from the STEM grant.

C. Instructional Programs only: How do course level student learning outcomes align with program learning outcomes?

The engineering core courses for the A.S. degree in Engineering and A.S. degree in Engineering Technology provide the theoretical base for upper division work at the university. Most of these courses require projects that result in a design and development of a product and all of these courses require significant problem solving methodologies. Thus, all the student learning outcomes in the engineering courses required for these degrees align with the third program learning outcome (Students will demonstrate a deep understanding of the core material required for transfer to a four year university degree program in engineering or engineering technology)

and the second program learning outcome (Students will demonstrate problem solving skills used in engineering or engineering technology design and product development).

ENGR B47 (Introduction to Engineering and Design) and ENGR B45 (Properties of Materials) include lab components which require safety training in addition to training on the use of equipment typically used in industry. ENGR B24 (Engineering Graphics) and ENGR B19c (Programming in Science and Engineering with C/C++) include training in software commonly used in the engineering field. Thus, the student learning outcomes in these courses align with the first program learning outcome (Students will demonstrate proficiency in technical skills and safety principles required for employment as an engineering technician or technologist).

D. How do the program learning outcomes align with [Institutional Learning Outcomes](#)?

The emphasis on problem solving in the second program learning outcome (Students will demonstrate problem solving skills used in engineering design and product development) aligns with the first institutional learning outcome (Pursue knowledge and evaluate its consequences). The third program learning outcome (Students will demonstrate a deep understanding of the core material required for transfer to a four year university degree program in engineering) aligns with the third institutional learning outcome (Demonstrate knowledge and abilities in a chosen area of study).

Although there are no program learning outcomes that directly link to the second and fourth institutional learning outcomes, there are student learning outcomes in ENGR B47 (Introduction to Engineering and Design) that align to these ILOs. In particular, the student learning outcomes “Document and present technical material by writing memos, reports and a resume in addition to participating with a team on oral presentations” and “Discuss ethical issues in engineering” align with the second and fourth institutional learning outcomes (“Communicate clearly and effectively in both written and oral forms” and “Appreciate their civic responsibilities”).

E. Describe *any significant changes* in your program’s strengths since last year.

Last year the program was taught by a combination of adjunct instructors and overload for full-time instructors. Despite this challenge the program saw an increase in students – 361 on census day versus 352 in 2012-13. This continues a positive growth trend that began in 2010-11. A full-time instructor was recently hired to teach and provide leadership for this program to continue to grow into the future.

**Curricular Changes:** State C-IDs were vetted for numerous engineering courses, although the Model Curriculum for Engineering has not yet been finalized. Engineering faculty aligned seven engineering courses to current C-IDs, six of which are still in the curriculum approval process of the college. Additionally, faculty are preparing a significant curricular change to the Engineering Technology A.S. degree shifting it from a transfer degree to a technician training program.

**Articulation with High Schools:** The EIT department continued creating a strong pathway program with Project Lead the Way (PLTW), obtaining funding through Chevron to offer a summer PLTW program for middle school students. In addition, college staff serve on the newly established Frontier HS PLTW Advisory Board.

**Articulation with Universities:** Currently, engineering faculty are developing a new MatLab course that will provide transfer opportunities in engineering for students interested in UC Santa Barbara. It is expected that once the Engineering Model Curricula is finalized, then articulation with four year universities will be modified and improved.

**Student Support Services:** Supplemental Instruction in the STEM program has expanded significantly with the addition of services located in the library and MS-3/4 in addition to the MESA Center (SE-46). The college will build a STEM Center this year using a \$500,000 donation from Aera Energy. With the addition of this center, student support services will be centralized for STEM students and it is expected that supplemental instruction will improve operationally. This should positively impact the engineering program since 38% of STEM students are majoring in engineering.

F. Describe *any significant changes* in your program's weaknesses since last year.

One limitation affecting the engineering program is the number of course sections that can be offered and the sequencing of courses. Engineering majors have a specific series of courses that are offered in a specific sequence. The MATH courses (B6a – B6d) and ENGR B47 are offered year-round. All of the other courses are offered specifically in Fall or Spring, depending on the course and its prerequisites. Increasing program enrollments has resulted in demand for additional lab sections for some as well courses to be offered out-of-sequence. For example, ENGR B45, a Fall-only course, was offered in spring 2014 due to a significant number of students who needed it for transfer. The College has also made recent efforts to expand the number of STEM offerings, including Engineering courses, at the Delano campus. Additionally, the new Engineering Science programs at Cal State Bakersfield (CSUB) have increased the enrollment in the engineering program. These growth factors need to be taken into account and resources should be made available to expand course offerings at both Bakersfield College campuses.

G. If applicable, describe any unplanned events that affected your program.

The full-time engineering instructor served as interim dean for 2013-2014 and accepted the position of permanent dean in July, 2014. This left the program staffed with adjunct faculty for 2013-2014 which adversely affected program planning. However, since the recent hire of a full-time engineering faculty, this should improve over the next year.

In an effort to expand the STEM program at the Delano campus, we reallocated a 3D printer to the Delano campus and in Summer, 2014 began to offer ENGR B47 (Introduction to Engineering and Design) at this campus.

### **III. Resource Analysis:**

A. Human Resources

1. If you are requesting any additional positions, explain briefly how the additional positions will contribute to increased student success. ([Faculty Request form](#); [Classified Request form](#))
2. Professional Development ([Professional Development form](#))
  - a. Describe briefly the effectiveness of the professional development your program has been engaged with (either providing or attending) during the last cycle, focusing on how it contributed to student success.
  - b. Provide rationale for future professional development opportunities and contributions that your program can make.

B. Facilities (M&O requests can be submitted by completing the [M&O request form.](#))

Has your area received any facilities maintenance, repair or updating in this cycle? No.

1. If yes, how has the outcome contributed to student success?

2. If no, how will your facilities request contribute to student success?
- C. Technology (Technology requests can be made by filling out the [ISIT Request form.](#))
1. Has your program received new or repurposed technology in this cycle? No.
    - a. If yes, how has this technology contributed to student success?
    - b. If no, how will your new or repurposed technology request contribute to student success?
  2. Do you need new or repurposed classroom technology to support student success and/or new office technology to support faculty/staff success? Justify your request.

The computers in the CAD labs, MS-9 and 10, need replacement. These labs are shared by the Industrial Drawing program, the Architecture program, and the Engineering program. The Engineering program makes specific use of MS-9 for several classes (ENGR B19C, B24, B47), although Engineering students take Industrial Drawing and Architecture courses held in MS-9 and 10. The engineering graphics course (ENGR B24) is required for transfer students and provides students with hands-on experience in the use of CAD software to solve engineering design problems and in the preparation of engineering drawings. The industry-standard design software utilized by each of these programs is updated annually and requires computers with increased processor speed and memory.

Because of the heavy use of MS-9 by the engineering program the STEM program manager has approved funds for that portion of the computer purchase from the STEM grant and the CSUB collaborative grant.

- D. Budget (Changes to the budget allocation can be requested using the [Budget Change Request Form](#)).  
If you are requesting any additional funding, explain briefly how it will contribute to increased student success.

#### **IV. 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).

Age and gender distributions in engineering have remained consistently similar over the last 5 years. However, the percentage of Hispanic students enrolled in engineering courses has increased 12% over the last five years, now equal to the 62% Hispanic enrollment college-wide.

- B. Changes in enrollment (headcount, sections, course enrollment and productivity).

Enrollment has remained stable due to the number of limited sections offered in the engineering program. Over the last five years, FTES have varied slightly. Last year FTES increased by 0.8 to 51.5, 1.0 less than the high in 2009 of 52.5. FTEF increased by about 2%, but productivity has decreased slightly by 1.4%.

- C. Success and retention for face-to-face, as well as online/distance courses.

Over the last 5 years, retention rates have remained fairly constant averaging between 86% and 92%. During 2013-2014 the retention rate was 90% which was slightly higher than the college-wide retention rate of 87% (only face-to-face). Success rates have also remained fairly constant averaging between 73% and 81%. During 2013-2014 the success rate was 78%, higher than the college-wide success rate of 70% (only face-to-face). Most engineering courses can be very challenging and a retention rate of 90% and success rate of 78% are positive indicators of a strong program.

D. Other program-specific data that reflects significant changes (*please specify or attach*).

The percentage of engineering students with completed Student Educational Plans (SEPs) increased roughly 10% over the last five years and remains high at 93% compared to 64% college-wide. Moreover, the percentage of declared engineering majors increased almost 21% from 2012-13 to 2013-14. This is due in large part to the student support services funded by the STEM grant.

**V. 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 (if applicable)
1. Continue to align the engineering curriculum with the C-IDs and MC once vetted.	<input checked="" type="checkbox"/> 1: Student Success <input checked="" type="checkbox"/> 2: Communication <input type="checkbox"/> 3: Facilities & Infrastructure <input type="checkbox"/> 4: Oversight & Accountability <input type="checkbox"/> 5: Integration <input type="checkbox"/> 6: Professional Development	<input checked="" type="checkbox"/> Completed: 9/17/2014 (Date) <input checked="" type="checkbox"/> Revised: 9/17/2014 (Date) <input checked="" type="checkbox"/> Ongoing: _____ (Date)	<i>Progress on Goal:</i> Most of the C-IDs were finalized and Engineering faculty submitted course revisions for most of these courses into CurricUNET. The faculty will be submitting a new course to align with the C-ID for a MatLab course. Once the Model Curricula is finalized, revisions to the program will be submitted.

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 (if applicable)
2. Establish a Creative Design Center and develop a cohort program with basic skills to engage students in technological skills.	<input checked="" type="checkbox"/> 1: Student Success <input type="checkbox"/> 2: Communication <input type="checkbox"/> 3: Facilities & Infrastructure <input type="checkbox"/> 4: Oversight & Accountability <input type="checkbox"/> 5: Integration <input type="checkbox"/> 6: Professional Development	<input type="checkbox"/> Completed: _____ (Date) <input checked="" type="checkbox"/> Revised: 9/17/2014 (Date) <input checked="" type="checkbox"/> Ongoing: _____ (Date)	<i>Progress on Goal:</i> The Creative Design Center is completed. Specific training for interdisciplinary faculty took place during FLEX week in August 2014. With the addition of specific student success initiatives within the Basic Skills area, development of a cohort program with the Creative Design Center will need to

			be re-evaluated.
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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 (if applicable)
3. Continue to address the gaps in core indicators, particularly the gap in female enrollment.	<input checked="" type="checkbox"/> 1: Student Success <input type="checkbox"/> 2: Communication <input type="checkbox"/> 3: Facilities & Infrastructure <input type="checkbox"/> 4: Oversight & Accountability <input type="checkbox"/> 5: Integration <input checked="" type="checkbox"/> 6: Professional Development	<input type="checkbox"/> Completed: _____ (Date) <input checked="" type="checkbox"/> Revised: <u>9/17/2014</u> (Date) <input checked="" type="checkbox"/> Ongoing: _____ (Date)	<i>Progress on Goal:</i> Much work still needs to be completed on this goal. Faculty are investigating webinars on female recruitment in STEM disciplines.

B. New or revised goals (if applicable)

New/Replacement Program Goal	Which institutional goals from the Bakersfield College Strategic Plan will be advanced upon completion of this goal? (select all that apply)	Anticipated Results
1. Improve clearly communicated pathways for engineering students by strengthening communication with Project Lead the Way programs at the high schools and middle schools.	<input checked="" type="checkbox"/> 1: Student Success <input checked="" type="checkbox"/> 2: Communication <input type="checkbox"/> 3: Facilities & Infrastructure <input type="checkbox"/> 4: Oversight & Accountability <input type="checkbox"/> 5: Integration <input type="checkbox"/> 6: Professional Development	Increased numbers of PLTW students who pursue engineering as a major at Bakersfield College.
2. Develop a summer research program for engineering majors in collaboration with CSUB.	<input checked="" type="checkbox"/> 1: Student Success <input type="checkbox"/> 2: Communication <input type="checkbox"/> 3: Facilities & Infrastructure <input type="checkbox"/> 4: Oversight & Accountability <input checked="" type="checkbox"/> 5: Integration <input type="checkbox"/> 6: Professional Development	Increased rigor and challenge in the program with more engaged engineering students. Increased communication and program articulation between engineering faculty at BC and CSUB.

**VI. Curricular Review (Instructional Programs only):**

A. Review of Course Information:

- Column A list all of the courses associated with the degree.
- Column B list the Fall term the review process will be started for ongoing compliance.
- Column C list the compliance due date.
- Column D list any changes to courses with regard to distance education.
- Column E list corresponding C-ID descriptors if available. <http://www.c-id.net/>

**\*\*Dates listed should reflect a five year cycle allowing for one year of review to maintain ongoing compliance.\*\***

A. Course	B. Fall Term Review will be Submitted	C. Compliance Due Date	D. Distance Education Changes	E. C-ID Descriptors Available
ENGR B17	2014	1/1/2018	None	ENGR 260
ENGR B19C	2018	12/1/2019	None	
ENGR B24	2014	11/1/2017	None	ENGR 150
ENGR B36	2014	2/1/2019	Included hybrid and online option	ENGR 130
ENGR B45	2014	2/1/2019	None	ENGR 140
ENGR B47	2015	5/1/2019	Will be adding hybrid option	
CHEM B1A	2016	2/1/2017	None	CHEM 110
MATH B6A	2017	11/1/2018	None	MATH 210
MATH B6B	2017	10/1/2018	None	MATH 220
MATH B6C	2017	11/1/2018	None	MATH 230
MATH B6D	2017	11/1/2018	None	MATH 240
PHYS B4A	2018	4/1/2019	None	PHYS 205
PHYS B4B	2018	4/1/2019	None	PHYS 210
PHYS B4C	2018	4/1/2019	None	PHYS 215

**B. Review of Program Information:**

Is the program information housed in CurricUNET accurate? (Considerations: changes in course(s) names and/or suffixes as well as additions/deletions of courses). If not, then a program modification needs to be started in CurricUNET to reflect the necessary changes. Explain the requested changes below.

CurricUNET information is correct

Is the program and course listing information in the current catalog accurate? If not, list the requested changes below. Catalog information should reflect what is in CurricUNET.

Catalog information is correct

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C. Student Education Plan (SEP) Pathway(s) uploaded to “Attached Files” in CurricUNET.

Completion of CSU Breadth and/or IGETC is not recommended for engineering transfer students.

If applicable, SEP Pathway with CSU Breadth indicated? Yes or No

If applicable, SEP Pathway with IGETC indicated? Yes or No

If applicable, SEP Pathway with BC General Education indicated?  Yes or No

**\*\*Please ensure that the information housed in CurricUNET and the current catalog match. \*\***

D. If applicable, provide a description of the program’s future adoption of C-ID descriptors and Associate Degree for Transfer (ADT) or Model Curricula.

Once Model Curricula (MC) is finalized, then Associate Degree will be aligned to this MC. However, MCs do not lead to an ADT. All courses will be aligned to C-ID descriptors as they are finalized.

### **VII. Conclusions and Findings:**

The Engineering Program at Bakersfield College has a long established record of success. Based on the improvements in student support services and articulated transfer pathways, the trend of increased enrollment in the program is expected to continue. The implementation of the state model curricula, once finalized, will provide increased opportunities in transfer for our engineering students. Future work to ensure program rigor and increased course availability will be vital to long-term success.

### **VIII. Attachments (place a checkmark beside the forms listed below that are attached):**

- |  |  |  |
|--|--|--|
| <input type="checkbox"/> <a href="#">Faculty Request Form</a>                      | <input type="checkbox"/> <a href="#">Classified Request Form</a> | <input checked="" type="checkbox"/> <a href="#">Budget Change Request Form</a> |
| <input type="checkbox"/> <a href="#">Professional Development</a>                  | <input checked="" type="checkbox"/> <a href="#">ISIT Form</a>    | <input type="checkbox"/> <a href="#">M &amp; O Form</a>                        |
| <input checked="" type="checkbox"/> <a href="#">Best Practices Form (Required)</a> | <input type="checkbox"/> Other: _____                            |  |

### **IX. Certificates of Achievement:**

Programs with stackable certificates fill out the following form.

Stand alone certificates fill out the entire Annual Update.

# Certificate Form

## Annual Update 2014-15

Name of Program: \_\_\_\_\_

Certificate Name	JSC	CA	Is the certificate stackable?	Is the certificate a stand alone program?

Please discuss the following questions regarding all area Certificates of Achievement (CA):

1. List certificates that are proposed for *addition*.
2. List certificates that are proposed for *deletion*.
3. For this CA, what are the SOC codes (Occupational Titles and codes) that students who complete the CA will be able to obtain entry-level employment in, and what are the projected annual openings and median salary for each occupational title? You can use your latest Program Review data for your response.
4. For this CA, what process was followed to ensure the required and possible elective courses were adequate for entry level employment (such as advisory committee input, surveys, industry feedback, licensing or accreditation agencies)? How often do/will you re-examine the effectiveness of certificate requirements?
5. What is your annual completion target (number of certificates awarded) for this CA? What was the number of awards in this CA for each of the past three years? Based on your results, what changes could you make in your program to meet or continue to exceed your target (such as course content, scheduling/sequence, outreach, instructional strategies)?