

Bakersfield College

Comprehensive Program Review

I. Program Information:

Program Name: Bachelor of Science, Industrial Automation

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: This is the first baccalaureate degree offered by the college and will provide preparation for employment in technical fields utilizing Industrial Automation. Upper division coursework will emphasize critical thinking, research, communication skills, and project based learning.

Program Mission Statement: To prepare individuals for technical management careers in industries which utilize automation, including the petroleum, manufacturing, logistics and agriculture industry sectors, in order to improve the regional economy.

Instructional Programs only:

- A. List the degrees and Certificates of Achievement the program offers
- B. If your program offers both an A.A. and an A.S. degree in the same subject, please explain the rationale for offering both.
- C. If your program offers a local degree in addition to the ADT degree, please explain the rationale for offering both.

Listed below is the proposed curriculum for the Bachelor of Science Degree in Industrial Automation. The required lower division curriculum consists of 60 units which includes the California State University General Education Breadth and six technical core courses. For the incoming college prepared full time freshmen student, the lower division coursework can be completed in two years. The sixty units of upper division coursework can also be completed in two years and includes 9 units of upper division general education and 51 units of technical courses.

Proposed Bachelor of Science in Industrial Automation Degree Curriculum

Total Lower Division GE	41
Total Lower Division Technical	19
Total Upper Division Technical	51
Total Upper Division GE	9
Total Units	120

Lower Division Curriculum

CSU GE Breadth	Units
A.1 Oral Communication	3
A.2 Written Communication (ENGL B1a)	3
A.3 Critical Thinking	3
B.1 Physical Universe (Physics B2a or higher required - satisfies B.3 Lab requirement) ¹	4
B.2 Life Science	3
B.3 Laboratory Activity	
B.2 Mathematics/Quantitative Reasoning (Math B1a required) ²	4
C. Arts and Humanities	9
D. Social Sciences	9
E. Lifelong Learning and Self-Development	3
Total	41

Lower Division Technical Core	Units
ELET B1 (Basic Electronics)	4
ELET B4 (Computer Integrated Manufacturing)	3
ELET B5 (Programmable Logic Controllers)	3
ELET B55a (Electric Motors - Controls)	3
ELET B56 (Instrumentation and Process Control)	3
ELET B70 (Mechanical Systems)	3
Total	19

¹Or Physics B4a or higher

²Or Math B2, Math B6a or higher

Upper Division Curriculum

Upper Division General Education	Units
Technical Writing	3
Industrial Organizational Psychology	3
Industrial Ethics	3
Total	9

Upper Division Technical Core	Units
INDT B100 (Industrial Safety Principles and Management)	3
INDR B100a (Industrial Design Graphics I)	3
INDR B100b (Industrial Design Graphics II)	3
INDT B110 (Materials Science for the Technician)	3
INDA B110 (IA Networks)	3
INDA B112 (IA Systems)	3
INDA B114 (IA Measurement)	3
INDA B116 (Industrial Motion Control)	3
INDA B120 (Industry Sector Seminar: Applied Automation)	3
INDA B122 (Industry Sector Seminar: Manufacturing and Production)	3
INDA B124 (Industrial Manufacturing Processes)	3
INDA B130 (Project Management and Budgeting)	3
INDA B132 (Leadership and Entrepreneurship)	3
INDA B134 (Quality Assurance)	3
INDA B135 (Facilities Planning and Operations)	3
INDA B140 (Systems Design and Integration)	3
INDA B141 (Systems Implementation)	3
Total	51

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

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 goals, please duplicate this section. **N/A – New Program**

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.	<input type="checkbox"/> 1: Student Learning <input type="checkbox"/> 2: Student Progression and Completion <input type="checkbox"/> 3: Facilities <input type="checkbox"/> 4: Oversight and Accountability <input type="checkbox"/> 5: Leadership and Engagement	<input type="checkbox"/> Completed: _____ (Date) <input type="checkbox"/> Revised: _____ (Date) <input type="checkbox"/> Ongoing: _____ (Date)	
2.	<input type="checkbox"/> 1: Student Learning <input type="checkbox"/> 2: Student Progression and Completion <input type="checkbox"/> 3: Facilities <input type="checkbox"/> 4: Oversight and Accountability <input type="checkbox"/> 5: Leadership and Engagement	<input type="checkbox"/> Completed: _____ (Date) <input type="checkbox"/> Revised: _____ (Date) <input type="checkbox"/> Ongoing: _____ (Date)	

B. 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.

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. Develop the curriculum outlines for 17 technical and 3 general education upper division courses and the program outline for Curriculum Committee approval.	<input checked="" type="checkbox"/> 1: Student Learning <input checked="" type="checkbox"/> 2: Student Progression and Completion <input type="checkbox"/> 3: Facilities <input type="checkbox"/> 4: Oversight and Accountability <input type="checkbox"/> 5: Leadership and Engagement	All upper division courses to Curriculum Committee by fall 2015 and approved for offering in fall 2016.	See action plan	Jason Dixon, Sean Caras, Liz Rozell
2. Submit Substantive Change to ACCJC.	<input type="checkbox"/> 1: Student Learning <input type="checkbox"/> 2: Student Progression and Completion <input type="checkbox"/> 3: Facilities <input checked="" type="checkbox"/> 4: Oversight and Accountability <input type="checkbox"/> 5: Leadership and Engagement	Prepare Substantive Change for submission to ACCJC November 7, 2015 meeting.	Complete & reviewed by September 30, 2015	Liz Rozell, Kate Pluta

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
3. Complete full curricular development of all upper division courses.	<input checked="" type="checkbox"/> 1: Student Learning <input checked="" type="checkbox"/> 2: Student Progression and Completion <input type="checkbox"/> 3: Facilities <input type="checkbox"/> 4: Oversight and Accountability <input type="checkbox"/> 5: Leadership and Engagement	Junior level courses fully developed by Fall, 2016 and Spring, 2017. Senior level courses fully developed by Fall, 2017 and Spring, 2018.	Begin in Spring, 2016 and complete by Fall, 2017.	Jason Dixon, Manuel Fernandez, Klint Rigby, Pat Aderhold, new faculty
4. Remodel SE-46 for new automation lab.	<input type="checkbox"/> 1: Student Learning <input type="checkbox"/> 2: Student Progression and Completion <input checked="" type="checkbox"/> 3: Facilities <input type="checkbox"/> 4: Oversight and Accountability <input type="checkbox"/> 5: Leadership and Engagement	Architect plans to be completed this by January, 2016. Construction will be June – September 2016.	See Action Plan	Liz Rozell, Jason Dixon, Manuel Fernandez
5. Identify and purchase automation equipment and supplies. Complete training on equipment.	<input type="checkbox"/> 1: Student Learning <input type="checkbox"/> 2: Student Progression and Completion <input checked="" type="checkbox"/> 3: Facilities <input type="checkbox"/> 4: Oversight and Accountability <input checked="" type="checkbox"/> 5: Leadership and Engagement	New hires will work with Electronics Technology faculty to identify appropriate equipment purchases and will attend training sessions on using this equipment.	Fall, 2015 to Summer, 2016	Manuel Fernandez, Jason Dixon, new faculty
6. Develop admission and student services support processes.	<input type="checkbox"/> 1: Student Learning <input checked="" type="checkbox"/> 2: Student Progression and Completion <input type="checkbox"/> 3: Facilities <input type="checkbox"/> 4: Oversight and Accountability <input type="checkbox"/> 5: Leadership and Engagement	Develop application process and documents, publish educational planning guides, plan orientation meetings and recruitment activities, counsel and guide students in the program.	Fall, 2015 to Summer, 2018	Cynthia Quintanilla, Sue Vaughn, Liz Rozell

III. Trend Data Analysis: N/A – New Program

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

- A. Changes in student demographics (gender, age and ethnicity).
- B. Changes in enrollment (headcount, sections, course enrollment, and productivity).
- C. Changes in achievement gap and disproportionate impact.
- D. Success and retention for face-to-face as well as online/distance courses.
- E. Degrees and certificates awarded (three-year trend data for each degree and/or certificate awarded).
- F. Other program-specific data (please specify or attach).

- G. List degrees and certificates awarded (three-year trend data for each degree and certificate awarded). Include targets (goal numbers) for the next three years.

Full Name of Degree or Certificate	2011- 2012	2012- 2013	2013- 2014	2014- 2015	2015- 2016	2016- 2017

IV. Program Assessment:

- A. List your Program Learning Outcomes (PLOs)/Administrative Unit Outcomes (AUOs).

ILO-PLO Mapping for the BAS in Industrial Automation

Institutional Learning Outcomes	Programming Learning Outcomes
<p>1. Think. Think critically and evaluate sources and information for validity and usefulness.</p>	<p>Upon completion of this program, a student will be able to:</p> <ul style="list-style-type: none"> Apply critical and analytical thinking skills to industry related problems, related to safety, quality assurance and design of systems.
<p>2. Communicate. Communicate effectively in both written and oral forms.</p>	<p>Upon completion of this program, a student will be able to:</p> <ul style="list-style-type: none"> Display effective communication skills, including presentation and technical writing skills.
<p>3. Demonstrate. Demonstrate competency in a field of knowledge or with job-related skills.</p>	<p>Upon completion of this program, a student will be able to:</p> <ul style="list-style-type: none"> Demonstrate a broad understanding of the mathematical and scientific principles utilized in industrial automation and manufacturing. Demonstrate competency in industrial automation and instrumentation, including relevant hardware and software utilized in industry.
<p>4. Engage. Engage productively in all levels of society—interpersonal, community, the state and nation, and the world.</p>	<p>Upon completion of this program, a student will be able to:</p> <ul style="list-style-type: none"> Manage automation and manufacturing projects applying knowledge of budgetary and scheduling principles in an ethical environment.

Items B-N are N/A – New Program

- B. How did your outcomes assessment results during the past three years inform your program planning? Use bullet points to organize your response.

- C. How did your outcomes assessment results during the past three years inform your resource requests? The results should support and justify resource requests for this year.
- D. Describe how the program monitors and evaluates its effectiveness.
- E. Describe how the program engages all unit members in the self-evaluation dialog and process.
- F. Provide recent data on the measurement of the PLOs/AUS., as well as a brief summary of findings.
- G. What have the program's PLO's/AUO's revealed or confirmed in the past three years?
- H. *If applicable*, list other information, data feedback or metrics to assess the program's effectiveness (e.g., surveys, job placement, transfer rates, output measurements).
- I. 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).
- J. How do the program learning outcomes or Administrative Unit Outcomes align with Institutional Learning Outcomes? All Student Affairs and Administrative Services should respond. **Please see table listed above.**
- K. How did your program address Equity, specifically referencing the achievement gap and disproportionate impact, over this comprehensive cycle?

Institutional Learning Outcomes:

Think: Think critically and evaluate sources and information for validity and usefulness.

Communicate: Communicate effectively in both written and oral forms.

Demonstrate: Demonstrate competency in a field of knowledge or with job-related skills.

Engage: Engage productively in all levels of society – interpersonal, community, the state and the nation, and the world.

- L. Discuss your program's strengths.
- M. Discuss your program's weaknesses.
- N. *If applicable*, describe any unplanned events that affected your program.

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>

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.
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. **N/A – New Program**
 - b. What professional development opportunities and contributions can your program make to the college in the future?

B. Facilities:

1. How have facilities' maintenance, repair or updating affected your program in the past year as it relates to student success? **N/A – New Program**

2. How will your Facilities Request for next year contribute to student success?

Renovation of SE-46 (MESA is being moved to the Aera STEM Success Center in spring 2016) will allow for the additional automation lab needed to support the senior level classes.

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? **N/A – New Program**
2. How will your new or repurposed classroom, office technology and/or equipment request contribute to student success? **See above**
3. Discuss the effectiveness of technology used in your area to meet college strategic goals. **N/A – New Program**

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

VII. Faculty and Staff Engagement: N/A – Faculty not hired nor reassigned to the program.

- A. Discuss how program members have engaged in institutional efforts such as college committees, presentations, and departmental activities.
- B. Instruction Only: Discuss how adjunct faculty are included in departmental training, discussions and decision-making.

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.

Industrial automation represents the technology-driven business model of the 21st century. In today's industry, an engineering team is involved in developing new products or systems. This team is typically composed of engineers, technologists and technicians. Engineers apply their knowledge of mathematics and science to develop ways to economically utilize natural resources for the benefit of mankind through a wide spectrum of activities including the conception, design, development and formulation of new systems and products. Technologists are typically graduates of baccalaureate-level programs that emphasize the *application* of scientific and technical knowledge; they participate in activities surrounding applied design, manufacturing, product assurance, sales and project management. Technicians work with equipment, assembling, repairing and testing devices or systems based on technical skills rather than scientific knowledge used in the original design.

Bakersfield College already offers a very comprehensive and rigorous curriculum for technician training within the Electronics Technology program, which includes the foundation coursework for Industrial Automation. Likewise, the local California State University, Bakersfield (CSUB), has developed a robust electrical engineering program that addresses the industry need for engineers. The employment gap in our service area exists with the lack of affordable education and training for the technologist with project management skills. This particular program in Industrial Automation targets occupations designed for the skill set of the technologist described above.

The Bachelor of Science degree in Industrial Automation focuses on the application of electronics and computer technology to industrial automation systems, including instrumentation and control, industrial robotics, and process control systems. The program prepares students for careers in the design, operation, and

management of industrial automation systems focusing on the local industries that utilize these technologies, such as petroleum production, food production, fabrication, and logistics. Significant emphasis is placed on project based learning facilitated by significant laboratory work.

Pedagogical goals of the program faculty include the modularization of the curriculum and expansion of active learning by providing increased sections of hybrid courses in which lecture material is provided online and labs are conducted face-to-face. These particular pedagogies will be integrated in much of the upper division coursework offered for the baccalaureate, providing accessibility to the program for workers who wish to advance in their current companies. Current curriculum development includes diverse delivery modes and a significant amount of project based learning facilitated by a strong lab component as shown in the table below.

Delivery Mode	Percentage of Upper Division Student Contact
Hybrid OR Face to Face	60%
Online	7%
Face to Face only	33%

Project Based Learning	Percentage of Upper Division Student Contact
Lecture	52%
Lab	48%

The lower Central Valley has a large base of production and logistics facilities in the following industry sectors: agricultural products processing, materials processing, manufacturing, aerospace, energy (petroleum, cogeneration, renewables), warehousing/logistics, and infrastructure/utilities. Each industry sector has a need for technical management, industrial safety, quality assurance, and other positions requiring more than an associate degree or two-year certificate of achievement. According to Economic Modeling Specialists International (*EMSI*) data, these types of positions in Kern County have grown over 11% since 2009 and are predicted to grow an additional 20% over the next 9 years.

Students receiving the Bachelor of Science degree in Industrial Automation at BC are qualified for managerial track occupations which require technical training in the automation field, as well as project management, systems implementation, sales, quality control, and manufacturing operations. There are over 4400 jobs in the Bakersfield service area that could be staffed with BAS graduates, with expected annual openings of 200 and median earnings of \$47/hour (*EMSI*).

According to local industry leaders, there is a shortage of qualified technical mid-management workforce in Kern County. This is supported by Occupational Employment Statistics (OES) findings in which there is a projected 12.4% increase in demand for general and operations managers from 2012-2022. Many companies hire from out-of-state with poor retention rates. Members from the newly established Industrial Automation Advisory Board stated that:

It is extremely evident that there is a need for a technically well trained mid management workforce; a workforce that can implement engineering designs and manipulate advanced technology to benefit various manufacturing processes while seamlessly communicating the technology processes to the team. We support Bakersfield College’s BS degree program due to the extreme need for employees with these advanced skills.

We are very excited to begin this program next year and believe the expected outcomes will truly meet workforce needs and improve the economics of our community.

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

Best Practices Form **(Required) N/A – New Program**

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: \_Substantive Change Document\_