



Industrial Automation

Degree

Industrial Automation, Bachelor of Science Degree

Industrial Automation, Associate of Science Degree

Industrial Automation

Bachelor of Science Degree

Industrial automation represents the technology-driven business model of the 21st century. In today's industry, engineers involved in developing new products or processes work closely with technologists who apply scientific and technical knowledge in the design, manufacturing, and repair of automation systems. Bakersfield College's Baccalaureate Degree Program in Industrial Automation will train students with the skill set those technologists require, meeting the needs of a host of local employers, including major companies in the agriculture, distribution, and manufacturing sectors.

This degree focuses on the application of electronics and computer technology to industrial automation systems, which may apply to various categories of job titles in the following areas:

- Maintenance of Industrial Equipment
- Automation (Programmable Logic Controllers/PAC's, robotics, materials and product handling, motion control motor drives, networked control systems, automated production equipment, integration of various technologies into solutions, and related areas)
- Process Control and Measurement (Instrumentation, Industrial Measurement)
- Quality Assurance/Quality Control
- Industrial Safety and Hygiene
- Technical Management (managing technical employees)
- Operations Management (managing company operations)
- Facilities Planning, Infrastructure, Upgrade Supervision
- Operations Management
- Technical Sales and Marketing
- Design and Engineering Operations (positions that do not require the employee to have completed a four-year Engineering degree and/or be licensed)

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.

There will be approximately 62 units of general education and major coursework for lower division requirements of the degree. The lower division general education pattern closely follows the CSU GE Breadth Course pattern, including specific GE courses required for this program. In addition, most of the lower division core electronics courses will need to be completed such as: basic electronics, computer integrated manufacturing, programmable logic controllers, and instrumentation/process control.

There will be 60 units of upper division coursework, including new upper division technical and general education courses. Upper division technical courses will cover a broad range of industrial topics including automation networks and systems, automation measurement and motion control, and automation applications in manufacturing and production processes, but will also include courses in project management, leadership and entrepreneurship, quality assurance and facilities planning and operations.

Mission

The Baccalaureate Program in Industrial Automation is designed to prepare individuals for technical management careers in industries that utilize automation, including the petroleum, manufacturing, logistics and agriculture industry sectors, in order to improve the regional economy.

Program Learning Outcomes:

Upon successful completion, the student will:

- apply critical and analytical problems solving skills to industry related problems dealing with safety, quality assurance and maintenance of systems.
- display effective communication skills including presentation and technical writing skills.
- consider mathematical and scientific principles in proposing solutions in the field of industrial automation and manufacturing.
- appraise and document industrial automation processes to propose solutions that integrate instrumentation and control hardware with software for manufacturing operations.
- evaluate and manage automation and manufacturing projects by applying their knowledge of resource allocation principles in an ethical environment.

Prerequisite Requirements

All prerequisite coursework must be completed with a "C" grade or higher.

- **ENGL B1A** (Expository Composition); 3 units at Bakersfield College or equivalent course at another accredited college.
- **MATH B1A** (Precalculus I), **MATH B2** (Basic Functions and Calculus for Business), OR **MATH B6A** (Analytic Geometry/Calculus I); 4 units at Bakersfield College or equivalent course at another accredited college.
- **PHYS B2A** (General Physics-Mechanics and Heat) OR **PHYS B4A** (Mechanics and Wave Motion); 4 units at Bakersfield College or equivalent course at another accredited college.
- **Critical Thinking (CSU GE Area A3)** - PHIL B7, or B9, or ENGL B1B, or B2, or B3, or COMM B5; 3 units at Bakersfield College or equivalent course at another accredited college.
- **Communication (CSU GE Area A1)** - COMM B1, or B4 or B8; 3 units at Bakersfield College or equivalent course at another accredited college.
- ny six of the following eight courses must be completed for admittance to the Baccalaureate Degree Program. However, all eight lower division technical core courses must be completed prior to graduation. Demonstrated competency in lower division core courses may satisfy this requirement subject to evaluation by program faculty.
 1. **ELET B1** (Basic Electronics) 4 units
 2. **ELET B4** (Computer Integrated Manufacturing) 3 units
 3. **ELET B5** (Programmable Logic Controllers) 3 units
 4. **ELET B55A** (Electric Motors - Controls) 4 units
 5. **ELET B56** (Instrumentation and Process Control) 3 units
 6. **ELET B58** (Advanced Programmable Logic Controllers) 3 units
 7. **ELET B61** (Telecommunications) 3 units
 8. **INDR B12** (Introduction to Drafting and CAD) 2 units

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Bachelor of Science Degree

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General Education

General Education courses meeting the CSU General Education Pattern are required to graduate with the BS in Industrial Automation from Bakersfield College. Twenty-nine of the 41 CSU GE units must be completed for admittance to the Baccalaureate Degree Program. Within these 29 units, CSU GE Areas A, B1, B3, B4 (as outlined above) must be satisfied. However, all 41 lower division GE units must be completed prior to graduation.

- A. English Language Communication and Critical Thinking (9 units)
 - A.1. Oral Communication (3 units)
COMM B1, or B4 or B8
(*COMM B8 recommended*)
 - A.2. Written Communication (3 units)
ENGL B1A
 - A.3. A.3 Critical Thinking (3 units)
PHIL B7, or B9, or ENGL B1B, or B2, or B3, or
COMM B5 (*COMM B5 recommended*)
- B. Scientific Inquiry and Quantitative Reasoning (9 units)
 - B.1. Physical Universe (4 units)
PHYS B2A or higher (prerequisite course)
 - B.2. Life Science
Any course listed in Area B.2 of the CSU General Education Pattern in the Bakersfield College Catalog (*Crop Science B5 recommended*)
 - B.3. 3 Laboratory Activity
PHYS B2A Lab or higher (prerequisite course)
 - B.4. Mathematics/Quantitative Reasoning (4 units)
MATH B1A or higher (prerequisite course)
- C. Arts and Humanities (9 units)
Any course as listed in Area C of the CSU General Education Pattern in the Bakersfield catalog. *Note: At least one course must be taken from Arts and one from Humanities*
 - C.1. Arts - one course (*ART B4 recommended*)
 - C.2. Humanities - one course; (*PHIL B10 recommended*)
 - C.1 or C.2 – Any one course (*SPAN B1 recommended*)
- D. Social Science (9 units)
Any three courses listed in Area D.1 – D.10 of the CSU General Education Pattern in the Bakersfield College Catalog.
(*ECON B1 or B2, HIST B17A or B17B, or POLS B1 recommended*)
- E. Lifelong Understanding and Self-Development (3 units)
Any one, three unit course as listed in Area E of the CSU General Education Pattern in the Bakersfield College Catalog (*PSYC B1A recommended*)

Application Procedure

The Engineering and Industrial Technology office must receive all application forms and transcripts during the designated filing period. For detailed information on the application period and procedures, please refer to the Baccalaureate Degree Program website at <http://www.bakersfieldcollege.edu/industrial-automation> or come to the Bakersfield College Engineering and Industrial Technology office in IT1.

Program Costs

An estimated cost for the first semester of the upper division program is approximately \$2,500

Curriculum Overview

The lower division coursework in the Baccalaureate Degree Program includes the general education requirements outlined in the California State University General Education Breadth course list in the addition to the existing electronics courses that comprise the technical core to prepare for upper division coursework.

Educational Planning

Success in the Baccalaureate Degree Program is best achieved by having a well-defined educational plan. Listed below is a suggested educational plan for Baccalaureate Degree Program applicants:

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Total Units: 120

Freshman Fall Semester

14 Units

Course #	Name	Units
POLS B1	American Government: National State and Local (GE Area D Social Sciences)	3.0
MATH B1A	Precalculus I (GE Area B4) ¹	4.0
ELET B5	Programmable Logic Controllers	3.0
ELET B1	Basic Electronics	4.0

Freshman Spring Semester

16 Units

Course #	Name	Units
ENGL B1A	Expository Composition (GE Area A2)	3.0
ART B4	Two-Dimensional Design (GE Area C Arts and Humanities)	3.0
PHYS B2A	General Physics-Mechanics and Heat (GE Areas B1/B3) ²	4.0
ELET B4	Computer Integrated Manufacturing	3.0
ELET B56	Instrumentation and Process Control	3.0

Sophomore Fall Semester

15 Units

Course #	Name	Units
CRPS B5	Plant Science (GE Area B2 Life Sciences)	3.0
COMM B5	Rhetoric and Argumentation (GE Area A3 Critical Thinking)	3.0
HIST B17A	History of the United States <i>or</i>	3.0
HIST B17B	History of the United States Since 1870 (GE Area D Social Sciences)	3.0
ELET B58	Advanced Programmable Logic Controllers	3.0
ELET B61	Telecommunications	3.0

Sophomore Spring Semester

15 Units

Course #	Name	Units
PSYC B1A	General Psychology (GE Area E Lifelong Learning and Self-Development)	3.0
COMM B8	Small Group Communication (GE Area A1 Oral Communication)	3.0
ELET B55A	Electric Motors - Controls	4.0
INDR B12	Introduction to Drafting and CAD	2.0
	<i>Lower Division Elective</i>	3.0

Junior Fall Semester

15 Units

Course #	Name	Units
ENGL B100	Technical Writing	3.0
INDA B100	Industrial Design Graphics I	3.0
INDA B105	Materials Science for the Technician	3.0
INDA B114	Industrial Safety Principles and Management	3.0
INDA B125	Operations Management in the Automation Field	3.0

Junior Spring Semester

15 Units

Course #	Name	Units
ECON B1	Principles of Economics-Micro <i>or</i>	3.0
ECON B2	Principles of Economics-Macro (GE Area D Social Sciences)	3.0
INDA B101	Industrial Design Graphics II	3.0
INDA B120	Industrial Automation Systems	3.0
INDA B122	Applied Methods of Motion and Process Control	3.0
INDA B135	Economic Decision Making	3.0

Senior Fall Semester

15 Units

Course #	Name	Units
PSYC B100	Industrial & Organization Psychology	3.0
PHIL B10	Introduction to Ethics (GE Area C Arts and Humanities)	3.0
INDA B132	Project Management	3.0
INDA B140	Quality Management	3.0
INDA B143	Materials and Maintenance Management	3.0

Senior Spring Semester

15 Units

Course #	Name	Units
PHIL B100	Industry Ethics	3.0
SPAN B1	Elementary Spanish I (GE Area C Arts and Humanities)	3.0
INDA B110	Industrial Automation Networks	3.0
INDA B144	Leadership	3.0
INDA B150	Systems Design and Integration	3.0

(1) Math B2 or Math B6a may also satisfy this requirement

(2) May obtain credit via scores on AP Physics test; Physics B4a will also satisfy this requirement

Industrial Automation

Associate of Science Degree

The Associate of Science in Industrial Automation is designed to prepare students for optimal success in higher education and technical careers in an environment that will encourage a lifelong pursuit of learning. This degree teaches essential skills that can be put to use as an industrial technician, electronics technician, field service representative, or salesperson. A degree holder will also be considered for potential promotions into supervision and management positions. They will also become valuable additions to technology-focused employers. Teaching and learning strategies will include student-centered, competency-based, and hands-on instruction. In addition, the program will set in place quality customer/technician and employer/employee relationship skills to assure workplace and educational competencies have been met.

Total Units: 28-29

Required Courses

Course #	Name	Units
ELET B1	Basic Electronics (DC and AC)	3
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 B58	Advanced Programmable Logic Controllers	3
ELET B61	Telecommunications	3
INDR B12	Introduction to Drafting & CAD	3
STDV B1	Educational Planning	1

Electives: Select at least three units from

Course #	Name	Units
ELET B70	Mechanical Systems	3
MFGT B1AB	Machine Tool Processes	3
WELD B1A	Introduction to Oxygen Acetylene Welding and Cutting	2
WELD B1B	Introduction to the Welding Processes	2
AUTO B20	Engine Theory, Design and Diagnosis	4

Program Course Sequence

Semester One (14 units—suggested GE listed)

Course #	Name	Units
ELET B1	Basic Electronics (DC and AC)	3
ELET B5	Programmable Logic Controllers	3
POLS B1	American Government: National, State and Local	3
MATH B1A	Precalculus I	4
STDV B1	Educational Planning	1

Program Learning Outcomes

Upon successful completion, the student will:

- Safely execute technical skills in lab environments that are required for employment in automation industries.
- Apply problem solving skills to automation design and product development.
- Demonstrate a deep understanding of the core material required for certification in automation programs.

To Achieve the Associate of Science Degree

In addition to the required general education pattern, students must complete the core courses listed below for the Associate of Science in Industrial Automation Degree. Students must also obtain a minimum grade point average of 2.0 with a grade of C or higher in all courses required for the major. A “P” (Pass) grade is not an acceptable grade for courses in this major.

Semester Two (16 units—suggested GE listed)

Course #	Name	Units
ELET B4	Computer Integrated Manufacturing	3
ELET B56	Instrumentation and Process Control	3
ENGL B1a	Expository Composition	3
ART B4	Two-Dimensional Design	3
PHYS B2A	General Physics—Mechanics and Heat	4

Semester Three (15 units—suggested GE listed)

Course #	Name	Units
ELET B58	Advanced Programmable Logic Controllers	3
ELET B61	Telecommunications	3
CRPS B5	Plant Science	3
HIST B17A	History of the United States	3
COMM B5	Rhetoric and Argumentation	3

Semester Four (16 units—it may be a range)

Course #	Name	Units
ELET B55a	Electric Motors-Controls	3
INDR B12	Introduction to Drafting and CAD	2
PSYC B1A	General Psychology	3
COMM B8	Small Group Communication	3
PHED	varies	1
ELET B70	Mechanical Systems	3
	or	
MFGT B1AB	Machine Tool Processes	3
	or	
WELD B1A	Introduction to Oxygen Acetylene Welding and Cutting	2
	or	
WELD B1B	Introduction to the Welding Processes	2
	or	
AUTO B20	Engine Theory, Design and Diagnosis	4

Industrial Automation Certificate of Achievement

The Certificate of Achievement in Industrial Automation is designed to prepare students for optimal success in higher education and technical careers in an environment that will encourage a lifelong pursuit of learning. This certificate encompasses the essential skills that can be put to use as an industrial technician, automation specialist, maintenance mechanic, or field service representative. A certificate holder will also become a valuable addition to technology-focused employers. Teaching and learning strategies will include student-centered, competency-based, and hands-on instruction. In addition, the program will set in place quality customer/technician and employer/employee relationship skills to assure workplace and educational competencies have been met.

Program Learning Outcomes

Upon successful completion, the student will:

- Safely execute technical skills in lab environments that are required for employment in automation industries.
- Apply problem solving skills to automation design and product development.
- Demonstrate a deep understanding of the core material required for certification in automation programs.

To Achieve the Certificate of Achievement

Students must complete the core courses listed below for the Certificate of Achievement in Industrial Automation. Students must also obtain a minimum grade point average of 2.0 with a grade of C or higher in all courses required for the major. A "P" (Pass) grade is not an acceptable grade for courses in this major.

Total Units: 12

Required Courses

Course #	Name	Units
ELET B1A	Basic Electronics	3.0
ELET B3	Programmable Logic Controllers	3.0
ELET B4	Computer Integrated Manufacturing	3.0
ELET B58	Advanced Programmable Logic Controllers	3.0