

**Kern Community College District – Bakersfield College
Program Modification**

Date Submitted: 9/29/2018

Program Title: Bachelor of Science Degree in Industrial Automation

Discipline: Industrial Automation

Award Type: Bachelor of Science Degree

TOPS Code: 0935.00

CIP Code: 15.0406

Justification for Proposal:

As a result of advisory board and faculty collaboration, adjustments are being made to more closely align the program to desired outcomes. Thus, this proposal is included to reflect these changes. In addition, minor edits were included to reduce confusion students have expressed about the program requirements. Removal of INDA B101 and more allowance for technical electives.

KERN COMMUNITY COLLEGE DISTRICT – BAKERSFIELD COLLEGE PROGRAM OF STUDY

Bachelor of Science Degree in Industrial Automation

The Baccalaureate Degree in Industrial Automation focuses on the application of electronics and computer technology to industrial automation systems, including instrumentation, 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, food production, fabrication, and logistics. Significant emphasis is placed on project-based learning facilitated by significant laboratory work.

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.

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.
- **PHYSICS B2a** (General Physics-Mechanics and Heat) **OR PHYSICS 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.
- Any six of the following nine courses must be completed for admittance to the Baccalaureate Degree Program. However, all nine 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 B1a** (Basic Electronics (DC)) 3 units
 2. **ELET B1b** (Electronic Circuits (AC and Analog)) 3 units
 3. **ELET B3** (Programmable Logic Controllers) 3 units
 4. **ELET B4** (Computer Integrated Manufacturing) 3 units
 5. **ELET B55A** (Electric Motors - Controls) 3 units
 6. **ELET B56** (Instrumentation and Process Control) 3 units
 7. **ELET B58** (Advanced Programmable Logic Controllers) 3 units
 8. **ELET B61** (Telecommunications) 3 units
 9. **INDR 12** (Introduction to Drafting and CAD) 3 units

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
 - A.2 Written Communication (3 units)
ENGL B1A
 - A.3 Critical Thinking (3 units)
PHIL B7, or B9, or ENGL B1b, or B2, or B3, or COMM B5
- B. Scientific Inquiry and Quantitative Reasoning (9 units)
 - B.1 Physical Universe (4 units)
PHYSICS B2a or higher (prerequisite course)
 - B.2 Life Science
Any course listed in Area B.2 of the of the CSU General Education Pattern in the Bakersfield College Catalog
 - B.3 Laboratory Activity
PHYSICS 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 three courses listed in Area C of the CSU General Education Pattern in the Bakersfield catalog. *Note: At least one course must be taken from Arts (C.1) and one from Humanities (C.2)*
- 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.
- 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

Application Procedure

The Engineering and Industrial Technology office must receive all application forms and transcripts during the designated filing periods. For detailed information on the application period and procedures, please refer to the Baccalaureate Degree Program website at <https://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 addition to the existing electronics courses that comprise the technical core to prepare for upper division coursework.

Lower Division Curriculum

IGETC OR 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.4 Mathematics/Quantitative Reasoning (Math B1a or higher required) ²	4
C. Arts and Humanities	9
D. Social Sciences	9
E. Lifelong Learning and Self-Development	3
Total	41

¹Or Physics B4a or higher

²Or Math B2, Math B6a or higher

Upper Division Curriculum

Upper Division Technical Core	Units
INDA B100 (Industrial Design Graphics I)	3
INDA B105 (Materials Science for the Technician)	3
INDA B110 (IA Networks)	3
INDA B114 (Industrial Safety Principles and Management)	3
INDA B120 (IA Systems - Robotics)	3
INDA B122 (Applied Methods of Motion and Process Control)	3
INDA B125 (Operations Management in the Automation Field)	3
INDA B132 (Project Management)	3
INDA B135 (Economic Decision Making)	3
INDA B140 (Quality Management)	3
INDA B143 (Materials and Maintenance Management)	3
INDA B144 (Leadership)	3
INDA B150 (Systems Design and Integration)	3
Total	39

Lower Division Technical Core	Units
ELET B1a (Basic Electronics (DC))	3
ELET B1b (Electronic Circuits (AC and Analog))	3
ELET B3 (Programmable Logic Controllers)	3
ELET B4 (Computer Integrated Manufacturing)	3
ELET B55a (Electric Motors - Controls)	3
ELET B56 (Instrumentation and Process Control)	3
ELET B58 (Advanced Programmable Logic Controllers)	3
INDR B12 (Introduction to Drafting and CAD)	3
ELET B61 (Telecommunications)	3
Total	27

Any Lower Division Electives (Complete at least 4 units, suggested below)	Units
ELET B70 (Mechanical Systems)	3
MFGT B1AB (Machine Tool Processes)	3
WELD B1A (Introduction to Oxygen Acetylene Welding and Cutting)	2
WELB B1B (Introduction to the Welding Processes)	2
AUTO B11 (Introduction to Automotive Technology)	4

Upper Division General Education	Units
ENGL B100 (Technical Writing)	3
PSYC B100 (Industrial and Organizational Psychology)	3
PHIL B100 (Industry Ethics)	3
Total	9

Total Lower Division GE	41
Total Lower Division Technical – Required	27
Total Lower Division Technical – Elective	4
Total Upper Division Technical - Required	39
Total Upper Division GE	9
Total Units	120

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.

Semester One (16 units – suggested GE listed)

Requirements	Dept. Name/#	Name	Units	CSU-GE	Sequence
Required Technical Core (9 units)	ELET B1a	Basic Electronics (DC)	3		Yr 1, Fall
	ELET B3	Programmable Logic Controllers	3		Yr 1, Fall
	INDR 12	Introduction to Drafting and CAD	3		Yr 1, Fall
Lower Division GE (7 units)	POLS B1	American Government	3	D.8	Yr 1, Fall
	MATH B1A	Precalculus I	4	B.4	Yr 1, Fall

Semester Two (15 units – suggested GE listed)

Requirements	Dept. Name/#	Name	Units	CSU-GE	Sequence
Required Technical Core (6 units)	ELET B4	Computer Integrated Manufacturing	3		Yr 1, Spring
	ELET B1b	Electronic Circuits (AC and Analog)	3		Yr 1, Spring
Lower Division GE (9 units)	ENGL B1A	Expository Composition	3	A.2	Yr 1, Spring
	ART B4	Two-Dimensional Design	3	C.1	Yr 1, Spring
	COMM B8	Small Group Communication	3	A.1	Yr 1, Spring

Semester Three (15 units – suggested GE listed)

Requirements	Dept. Name/#	Name	Units	CSU-GE	Sequence
Required Technical Core (6 units)	ELET B58	Advanced Programmable Logic Controllers	3		Yr 2, Fall
	ELET B55A	Electric Motors – Controls	3		Yr 2, Fall
Lower Division GE (9 units)	CRPS B5	Plant Science	3	B.2	Yr 2, Fall
	HIST B17A	History of the United States	3	D.6	Yr 2, Fall
	COMM B5	Rhetoric and Argumentation	3	A.3	Yr 2, Fall

Semester Four (14 units–may be a range–suggested GE listed, suggested Tech Electives listed)

Requirements	Dept. Name/#	Name	Units	CSU-GE	Sequence
Required Technical Core (6 units)	ELET B56	Instrumentation and Process Control	3		Yr 2, Spring
	ELET B61	Telecommunications	3		Yr 2, Spring
Lower Division GE (4 units)					
Technical Electives (at least 4 units)	PHYS B2A	General Physics-Mechanics and Heat	4	B.1 & B.3	Yr 2, Spring
	ELET B70 or MFGT B1AB or WELD B1A or WELD B1B or AUTO B20	Mechanical Systems (3) Machine Tool Processes (3)	4		Yr 2, Spring
		Introduction to Oxygen Acetylene Welding and Cutting (2)			
		Introduction to the Welding Processes (2)			
		Engine Theory, Design and Diagnosis (4)			

Semester Five (15 units)

Requirements	Dept. Name/#	Name	Units	CSU-GE	Sequence
Required Technical Core (12 units)	INDA B100	Industrial Design Graphics I	3		Yr 3, Fall
	INDA B110	Industrial Automation Networks	3		Yr 3, Fall
	INDA B114	Industrial Safety	3		Yr 3, Fall
	INDA B125	Operations Management	3		Yr 3, Fall
Upper Division GE (3 units)	ENGL B100	Technical Writing	3		Yr 3, Fall

Semester Six (15 units – suggested GE listed)

Requirements	Dept. Name/#	Name	Units	CSU-GE	Sequence
Required Technical Core (12 units)	INDA B105	Materials Science for the Technician	3		Yr 3, Spring
	INDA B120	Industrial Automation Systems	3		Yr 3, Spring
	INDA B135	Economic Decision Making	3		Yr 3, Spring
	INDA B140	Quality Management	3		Yr 3, Spring
Lower Division GE (3 units)	ECON B1	Principles of Economics - Micro	3	D.2	Yr 3, Spring

Semester Seven (15 units – suggested GE listed)

Requirements	Dept. Name/#	Name	Units	CSU-GE	Sequence
Required Technical Core (9 units)	INDA B122	Applied Methods of Motion and Process Control	3		Yr 4, Fall
	PSYC B1A	General Psychology	3	E	Yr 4, Fall
	INDA B132	Project Management	3		Yr 4, Fall
Lower Division GE (3 units)	PHIL B10	Introduction to Ethics	3	C.2	Yr 4, Fall
Upper Division GE (3 units)	PSYC B100	Industrial & Organizational Psychology	3		Yr 4, Fall

Semester Eight (15 units – suggested GE listed)

Requirements	Dept. Name/#	Name	Units	CSU-GE	Sequence
Required Technical Core (9 units)	INDA B143	Materials and Maintenance Management	3		Yr 4, Spring
	INDA B144	Leadership	3		Yr 4, Spring
	INDA B150	Systems Design and Integration	3		Yr 4, Spring
Lower Division GE (3 units)	SPAN B1	Elementary Spanish I	3	C.2	Yr 4, Spring
Upper Division GE (3 units)	PHIL B100	Industry Ethics	3		Yr 4, Spring

Program Learning Outcomes

Upon completion of this program, a student will be able to:

1. Apply critical and analytical thinking skills to industry related problems, related to safety, quality assurance and design of systems.
2. Display effective communication skills, including presentation and technical writing skills.
3. Demonstrate a broad understanding of the mathematical and scientific principles utilized in industrial automation and manufacturing.
4. Demonstrate competency in industrial automation and instrumentation, including relevant hardware and software utilized in industry.
5. Manage automation and manufacturing projects applying knowledge of budgetary and scheduling principles in an ethical environment.

Program Matrix

Courses	PLO1	PLO2	PLO3	PLO4	PLO5
INDA B100		X		X	
INDA B105	X	X	X		
INDA B110		X	X	X	
INDA B114	X	X			
INDA B120	X	X	X	X	
INDA B122		X	X	X	
INDA B125	X	X		X	
INDA B132	X				X
INDA B135	X	X		X	
INDA B140	X				X
INDA B143	X		X		X
INDA B144	X	X			X
INDA B150	X	X	X	X	X

Approvals

- *Curriculum Committee Approval Date:*
- *Board of Trustees Approval Date:*
- *State Approval Date:*