

ENGINEERING & MANUFACTURING TECHNOLOGY



COOPERATIVE EDUCATION in TECHNOLOGY

ASSOCIATE IN APPLIED SCIENCE

Your Butler experience will prepare you for employment in your chosen area of study. Cooperative Education credit opportunities can be found throughout a wide variety of Butler programs. This program allows students to earn college credit and a degree for work experience related to their chosen field of study. One college credit is awarded for every 75 hours worked. Up to six hours of credit can be awarded per semester.

General Education Requirements

Course	Hours
Communications	6
___English Comp I	
___One other course	(EG 102, SP 100, SP 102, EG 112)
Science and Math	9
___Math Requirement	(MA 114 or above)
___Lab Science Requirement	
___Computer Science Requirement	

Social/Behavioral Science Requirement **3**
 ___One course from either Social or Behavioral Science

Humanities/Fine Arts **3**
 ___One course from either Humanities or Fine Arts

Physical Education **1**
 ___Physical Education Requirement

Required Technical Specialty Courses **30**

Required Related Electives **10**

A total of 62 credit hours is required for this degree. In addition to the 22 credit hours of general education requirements 10 hours of related electives and 30 credit hours of a technical specialty (at least 12 hours of the technical specialty must be in cooperative education with a maximum of 24 hours) of your choice in business, manufacturing or technology in these technical areas are required.

- ___Accounting
- ___Agriculture
- ___Auto Technology
- ___Business
- ___Collision Repair
- ___Computer Information Technology
- ___Engineering Technology
- ___Fire Science
- ___Hospitality Management
- ___Integrated Manufacturing Technology
- ___Marketing and Management
- ___Welding

Cooperative Education
 Career/Transfer Program
 Degree Offered: Associate in Applied Science
 Credits Required: 62
 Contact: Dena Smoot, Team Leader for Cooperative Education/Internships, at 316.218.6125

Program Information
 This degree program is designed for people who are employed in their field of study and would like to earn an Associate in Applied Science Degree.

Requirements
 You must be employed in a job related to your career field or to your major field of study You must work 75 hours on your job for each credit hour of Cooperative Education/Internship. You must complete the academic requirements contained in a portfolio provided by the faculty coordinator. You must show growth on the job by accomplishing a list of objectives agreed to by you, your job supervisor, and faculty coordinator.

Recommended Course Sequence
 Semester 1:
 EG 101, MA 114 or above, 3 hours of Tech. Spec. Req. and 6 hours of CP197
 Semester 2:
 English Comp II Tech. Writing, Speech or Business Communication, Social, or Behavioral Science, 3 hours of Tech. Spec. Req. and 6 hours of CP 198
 Semester 3:
 Lab Science Req., Computer Science, PE Req., 3 hours of Tech. Spec. Req. and 6 hours of CP 297
 Semester 4:
 Humanities/Fine Arts, 6 Hours of Tech. Spec. Req. and 6 hours of CP 298.

High School Articulation Credit:
 Student must submit a portfolio of drawings for review by lead instructor prior to enrollment. Students must also maintain a 3.0 GPA in all CAD/Drafting courses.

After Butler
 Recent graduates hold positions in a large variety of areas. Students transfer to 4-year private colleges

Engineering Technology

Career Program

Degree Offered: Associate in

Applied Science

Credits Required: 62

Contact: Mel Whiteside, Lead Instructor at 316.218.6135 or Becki Foster, Technical Advancement Director, at 316.322.3277

Accreditation

This program is certified through the American Design Drafting Association, Level: Design/Drafter

Prior to Admission

Students are required to take the ASSET test. Students must score a minimum of 37 Reading, 35 Writing, and 35 Numerical Math.

Additional Costs

An additional \$25 lab fee is assessed to each program course and subject to change.

Recommended Course Sequence

Graphics I/EN 101 is recommended before upper level EN Courses

After Butler

Recent graduates hold positions as Mechanical Engineering Technicians. After finishing a bachelor's degree, graduates hold positions as aeronautical, electrical, electronic or mechanical engineers, architects, and drafters.

Median Wage for Architectural and Civil Drafters in South Central Kansas is \$34,050 per year.

Median Wage for Civil Engineering Technicians in South Central Kansas is \$34,258 per year.

High School Articulation Credit

Prior to enrollment student must submit a drawing portfolio for review by lead instructor and pass a drawing exam. Students must also maintain a 3.0 GPA in all CAD/Drafting courses.

Median Wage for Mechanical Engineering Technicians in South Central Kansas is \$40,706 per year. (Source: Kansas Department of Human Resources Local Area IV, 2003 edition Source: Workforce Planning Guide & Wage Survey, Local Area IV 2003 Edition, KDHR.)

ENGINEERING GRAPHICS TECHNOLOGY

ASSOCIATE IN APPLIED SCIENCE

Your Butler experience will prepare you to apply technical skills and advanced computer software and hardware to the creation of graphic representations and simulations in support of architectural and engineering projects. This course includes instruction in engineering graphics, two-dimensional and three-dimensional design, solid modeling, engineering animation, computer-aided design and drafting (CADD) and AutoCAD techniques.

General Education Requirements

Course	Hours
Communications	9
___ English Comp I (EG 101)	
___ Public Speaking (SP 100)	
___ One other course (EG 102, EG 112)	

Science and Math

___ Math Requirement (MA 135, MA 140 or above)	9
___ Science Requirement (PH 109 or above)	

Social/Behavioral Science Requirement

___ Sociology (BS 105) or	3
___ General Psychology (BS 160)	

Required Courses

	Hours
___ Drawing and Composition I (AR 141)	3
or	
___ Two-Dimensional Design (AR 121)	3
___ Graphics I (EN 101)	3
___ Graphics II (EN 102)	3
___ Residential Design and CAD I (EN 103)	3
___ Introduction to Surveying (EN 104)	
___ or Manufacturing Processes (IT 204)	3
___ Engineering Concepts (EN 115)	2
___ 3D Modeling & CAD (EN 214)	3
___ Commercial Building Design and CAD (EN 211)	3
___ Special Problems in Drafting & CAD (EN 206)	2
___ Structural, Civil and Pipe Design & CAD (EN 217)	3
___ AutoCAD Advanced (EN 207)	3

A total of 62 credit hours is required for this degree. In addition to the 21 credit hours of general education requirements and 31 credit hours of required courses, 10 credit hours of related electives are required.

Related Electives

___ Any Integrated Manufacturing Technology (IT) Course.	10
___ Any Welding (WE) course.	
___ Surveying II (EN 204)	3
___ Statics (EN 260)	3
___ Technical Writing (EG 112)	3
___ PC Visual Basic Programming (IN 108)	3
___ Introduction to Programming (IN 105)	3
___ Physical Geology (PS 102)	4
___ Special Topics (EN 253/254)	3
___ Internship I-II (EN 193/194)	1-3
___ Cooperative Education I, II, III, IV (EN 197, 198, 297, 298)	2-6

PRE-ENGINEERING

ASSOCIATE IN SCIENCE

Course	Hours	
Communications	9	
___English Comp I (EG 101)		
___English Comp II (EG 102)		
___Public Speaking (SP 100)		
Science and Math	11	
___Calculus I with Analytic Geometry (MA 151)		
___College Chemistry I (CH 110)		
___Calculus II with Analytic Geometry (MA 152)		
Social/Behavioral Science	6	
___Social Science Requirement		
___Behavioral Science Requirement		
Humanities/Fine Arts	6	
___Humanities Requirement		
___Fine Arts Requirement		
Physical Education	1	
___Physical Education Requirement		

A minimum of 62 credit hours is required for the Associate in Science degree. In addition to general education requirements, coursework to complete this Associate in Science degree is listed below:

Required Courses	Hours
___Calculus III with Analytic Geometry (MA 253)	3
___Differential Equations (MA 260)	3
___Physics I (PH 251)	5
___Physics II (PH 252)	5
___General Organic Chemistry (CH 230)	5
___Graphics I or College Chemistry II (EN 101 or CH 115)	3-5*
___Engineering Concepts (EN 115)	2
___Statics (EN 260)	3

*Students interested in civil, electrical, industrial and mechanical options of pre-engineering need Graphics I. Students interested in chemical, nuclear and petroleum options of pre-engineering should enroll in Chemistry II. Advisement in either course for any option should be verified by future university of choice. Also see "Engineering Technology."

Program Information

Courses available range from basic math and algebra to calculus, differential equations and statistics. Butler County has agreements with the state universities for course transfer.

ENGINEERING GRAPHICS TECHNICIAN

CERTIFICATE

Your Butler experience will prepare you to apply technical skills and advanced computer software and hardware to the creation of graphic drawings and simulations in support of architectural and engineering projects. This program includes learning in engineering graphics, two-dimensional and three-dimensional design, solid modeling, 3D animation, computer-aided design drafting (CADD) and AutoCAD applications.

Prior to Admission

Students are required to take the ASSET test. Students must score a minimum of 35 Reading, 35 Writing, and 33 Numerical Math.

Required Courses	Hours
___Drawing and Composition I (AR 141)	3
___Graphics I (EN 101)	3
___Graphics II (EN 102)	3
___Residential Design and CAD I (EN 103)	3

___Engineering Concepts (EN 115)	2
___Special Problems in Drafting & CAD (EN 206)	2
___Commercial Building Design and CAD (EN 211)	3
___3D Modeling & CAD (EN 214)	3
___Structural, Civil and Pipe Design & CAD (EN 217)	3
___Math Requirement (MA 114 or above MA 131 rec.)	3
___Applied Physics I (PH 109)	3

Certificate requires 31 credit hours.

Pre-Engineering - Career Program

Degree Offered: Associate in Science
Credits Required: 62
Contact: Larry Friesen, Lead Mathematics/Engineering Instructor, at 316.322.3138

Requirements - see Program of Study

Recommended Course Sequence

Semester 1: EG 101, MA 151, CH 110, EN 115, Physical Education Requirement
Semester 2: EG 102, MA 152, EN 101 or CH 115, Semester 3: MA 253, PH 251, SP 100, Humanities Requirement, or Electives Semester 4: MA 260, PH 252, EN 260, Behavioral Science Requirement, Fine Arts Requirement

Recommended Electives

Any IN Programming course; Any IT Integrated Technology course, Graphics I & II, EC200

After Butler

Career opportunities include Aerospace Engineering, Chemical Engineering, Electrical Engineering, Industrial Engineering, Mechanical Engineering, and Nuclear Engineering.

Median Wage for Architectural and Civil Drafters in South Central Kansas is \$34,050 per year. Median Wage for Civil Engineering Technicians is \$34,258 per year. Median Wage for Mechanical Engineering Technicians is \$40,706 per year. (Source: Kansas Department of Human Resources Local Area IV, 2003 edition.)

Engineering Graphics Technician

Career Program
Certificate in Engineering Technician
Credits Required: 31
Contact: Mel Whiteside, Lead Instructor, at 316.218.6135 or Becki Foster, Technical Advancement Director, at 316.322.3277

Accreditation

This program is certified through the American Design Drafting Association, Level: Design/Drafter

Recommended Course Sequence

Graphic I/EN 101 is recommended before upper level EN Courses

Additional Costs

An additional \$25 lab fee is assessed to each program course and subject to change.

After Butler

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Manufacturing Engineering Technology

Career Program

Degree Offered: Associate in Applied Science in Manufacturing Technology

Credits Required: 64

Contact: Buford Pringle, Lead Instructor, at 316.218.6136 or Becki Foster, Technical Advancement Director, at 316.322.3277

Accreditation

Lead Instructor, Certified Manufacturing Technologist (CMfgT)

Prior to Admission

Students are required to take the ASSET test. Students must score a minimum of 37 Reading, 35 Writing, and 35 Numerical Math.

Recommended Course Sequence

Semester 1: IT 100, IT 102, IT 204, IT 120, IT 218

Semester 2: IT 220, IT 141, EN 101, MA 131,

Semester 3: IT 226, IT 227, IT 228

Semester 4: IT 117, IT 215, IT 205, Advanced Programming Course

University Articulations

Students wishing to take advantage of articulations with WSU or most universities are advised to complete up through PH 251 Physics I, which requires several Math prerequisites.

Additional Costs

Courses with labs have a \$50 lab fee and are subject to change.

After Butler

Recent graduates hold positions in manufacturing, machining, CNC (Computer Numerical Control) operation.

Median Wage for Computer-Controlled Machine Tool Operators in South Central Kansas is \$37,523 per year. Median Wage for Numerical Tool and Process Control Programmers in South Central Kansas is \$44,357 per year. Median Wage for a Manufacturing Technologist in South Central Kansas is \$42,220 per year. (Source: Workforce Planning Guide & Wage Survey, Local Area IV 2003 Edition, KDHR.)

MANUFACTURING ENGINEERING TECHNOLOGY

ASSOCIATE IN APPLIED SCIENCE

Your Butler experience will prepare you to apply basic engineering principles and technical skills to the identification and resolution of production problems in the manufacture of products. This program provides instruction in machine operations, production line operations, engineering analysis, systems analysis, instrumentation, physical controls, automation, computer-aided manufacturing (CAM), manufacturing planning, quality control, and informational infrastructure.

A total of 64 hours is required for this degree. In addition to the 18 credit hours of general education requirements and 36 hours of required courses, students must choose 10 credit hours from the list of related electives below:

General Education Requirements

Course	Hours
Communications	9
___ English Comp I (EG 101)	
___ Public Speaking (SP 100)	
___ One other course (EG 102, EG 112)	
Science and Math	6
___ Math Requirement (MA 131)	
___ Science Requirement (PH 109/110 strongly advised)	

Social/Behavioral Science Requirement

___ Sociology (BS 105) or	3
___ General Psychology (BS 160)	

Required Courses

Course	Hours
___ Graphics I (EN 101)	3
___ Graphics II (EN 102)	3
___ Machine Processes I (IT 100)	3
___ Machine Processes II (IT 102)	3
___ Beginning Concepts of CNC (IT 120)	3
___ Machine Trades Print Reading (IT 150)	3
___ Manufacturing Processes (IT 204)	3
___ Industrial Safety (IT 205)	3
___ Basic Catia (IT 218)	3
___ Adv. Automated Manufacturing with CNC (IT 220)	3
___ Introduction to Material Science (IT 226)	3
___ Manufacturing Science (IT 227)	3

Students may substitute six hours of programming (Featurecam IT 216, IT 221; Mastercam IT 217, IT 225; or Catia IT 218, IT 219) for EN 101 or EN 102.

Related Electives

Course	Hours
___ Engineering Concepts (EN 115)	2
___ Industrial Supervision (IT 141)	3
___ Mechanical Devices and Sys (IT 116)	3
___ Fluid Power (IT 117)	3
___ Cooperative Education (IT 197)	3
___ Basic Featurecam (IT 216)	3
___ Basic Mastercam (IT 217)	3
___ Advanced Featurecam (IT 221)	3
___ Advanced Mastercam (IT 225)	3
___ Advanced Catia (IT 219)	3

MANUFACTURING ENGINEERING TECHNOLOGY

CERTIFICATE

Your Butler experience will prepare you to apply basic engineering principles and technical skills to the identification and resolution of production problems in the manufacture of products. This program provides instruction in machine operations, production line operations, engineering analysis, systems analysis, instrumentation, physical controls, automation, computer-aided manufacturing (CAM), manufacturing planning, quality control, and informational infrastructure.

Prior to Admission

Students are required to take the Asset test. Students must score a minimum of 35 Reading, 35 Writing, and 33 Numerical Math.

Required Courses

		Hours
___Graphics I	(EN 101)	3
___Graphics II	(EN 102)	3
___Machine Processes I	(IT 100)	3
___Machine Processes II	(IT 102)	3
___Beginning Concepts of CNC	(IT 120)	3
___Machine Trades Print Reading	(IT 150)	3
___Manufacturing Processes	(IT 204)	3

___Industrial Safety	(IT 205)	3
___Basic Catia	(IT 218)	3
___Adv. Automated Manufacturing with CNC	(IT 220)	3
___Intro to Material Science	(IT 226)	3
___Manufacturing Science	(IT 227)	3

Students who specialize in Machine Programming may substitute six hours of programming (Featurecam, IT 216, IT 221: Mastercam, IT 217, IT 225; or Advanced Catia IT 219) for En 101 or EN 102.

Three hours of related electives from the following: IT 116 Mechanical Devices and Systems, IT 117 Fluid Power, IT 212 Geometric Dimensioning and Tolerancing, IT 216 Basic Featurecam, IT 217 Basic Mastercam, IT 221 Advanced Featurecam, IT 225 Advanced Mastercam, IT 219 Advanced Catia.

Certificate requires 38 credit hours.

Manufacturing Engineering Technology

Career Program

Certificate in Manufacturing Technology and eligibility to take the Society of Manufacturing Engineers (SME) certification test
Credits Required: 38
Contact: Buford Pringle, Lead Instructor, at 316.218.6136 or Becki Foster, Technical Advancement Director, at 316.322.3277

Accreditation

Lead instructor is a Certified Manufacturing Technologist.

Prior to Admissions

Students are required to take the ASSET test. Students must score a minimum of 37 Reading, 35 Writing, and 35 Numerical Math.

Recommended Course Sequence

Semester 1:
IT 100, IT 102, IT 204, IT 120, IT 205
Semester 2:
IT 220, IT 141, EN 101, MA 131,
Semester 3:
IT 226, IT 227, IT 228
Semester 4:
IT 117, IT 215, Advance Programming

Additional Costs

Courses with labs have a \$50 lab fee and are subject to change.

After Butler

Recent graduates hold positions in manufacturing, machining and CNC (Computer Numerical Control) operation

Median Wage for Computer-Controlled Machine Tool Operators in South Central Kansas is \$37,523 per year. Median Wage for Numerical Tool and Process Control Programmers in South Central Kansas is \$44,357 per year. (Source: Workforce Planning Guide & Wage Survey, Local Area IV 2003 Edition, KDHR.)

Welding Technology

Career Program
Degree Offered: Associate in Applied Science
Credits Required: 62
Contact: Matt Galbraith, Lead Instructor, at 316.323.6824 or Becki Foster, Technical Advancement Director, at 316.322.3277

Recommendations

These classes are in high demand and fill quickly. Enrollment is limited.

Accreditation

Lead Instructor is an AWS Certified Welding Instructor.

Additional Costs/Tool Requirement

An additional \$25 lab fee is assessed to each program course and subject to change.

Prior to Admission

Students are required to take the ASSET test. Students must score a minimum of 37 Reading, 35 Writing, and 35 Numerical Math.

Recommended Course Sequence

Semester 1:
WE 121, WE 112, WE 116, WE 113, WE 114, WE 111, WE 215
Semester 2:
WE 122, WE 220, WE 119, WE 219, WE 216, WE 212, WE 213
Semester 3:
General Education Classes
Semester 4:
General Education Classes

After Butler

Recent graduates hold positions as welders, welding inspectors or supervisors, and welding sales representatives.

Median Wage for Welders, Cutters, Solderers, and Brazers in South Central Kansas is \$30,905 per year. (Source: Workforce Planning Guide & Wage Survey, Local Area IV 2003 Edition, KDHR.)

WELDING TECHNOLOGY

ASSOCIATE IN APPLIED SCIENCE

Your Butler experience will prepare you to apply technical knowledge and skills to join or cut metal surfaces. Includes instruction in various welding and cutting processes, blueprint reading, and metallurgy, all as applied to both ferrous and non-ferrous metals.

General Education Requirements

Course	Hours
Communications	6
___English Comp I (EG 101)	
___Public Speaking (SP 100)	
Science, Math and Computer Science	9
___Math Requirement (MA 114 or above)	
___Science Requirement (PH 109 or above)	
___Computer Science Requirement	
Social/Behavioral Science Requirement	3
___Sociology (BS 105) or	
___General Psychology (BS 160)	

Required Courses

		Hours
Fall		
___Welding Survey (WE 111)		3
___OxyFuel Gas Welding (WE 112)		2
___Cutting Operations (WE 113)		2
___Welding Methods (WE 114)		2
___Shielded Arc Welding (WE 116)		3
___Fundamentals of Welding I (WE 121)		3
___Gas Tungsten Arc Welding (WE 215)		3
Spring		
___Blueprint Reading Welding (WE 119)		3
___Fundamentals of Welding II (WE 122)		3
___Automatic Arc & Inert Gas welding (WE 212)		2
___Pipe Welding and Fitting (WE 213)		2
___Welding Problems (WE 216)		2
___Gas Metal Arc Welding (WE 219)		2
___Metallurgy (WE 220)		3

A total of 62 credit hours is required for this degree. In addition to the 18 credit hours of general education requirements and 35 credit hours of required courses, you must choose 9 credit hours from the list of related electives below:

Related Electives		9
___Intro to Business (BA 110)		3
___Personal Finance (BA 112)		3
___Business Law I (BA 115)		3
___Accounting I (BA 126)		3
___Personal Selling (BA 215)		3
___Principles of Management (BA 210)		3
___Industrial Supervision (IT 141)		3
___Industrial Safety (IT 205)		3
___Cooperative Education I, II, III, IV (WE 197, 198, 297, 298)		2-5

WELDING TECHNOLOGY

CERTIFICATE

Your Butler experience will prepare you to apply technical knowledge and skills to join or cut metal surfaces. Includes instruction in various welding and cutting processes, blueprint reading, and metallurgy, all as applied to both ferrous and non-ferrous metals.

Prior to Admission

Students are required to take the Asset test. Students must score a minimum of 35 Reading, 35 Writing, and 33 Numerical Math.

Required Courses

Required Courses	Hours
Fall	
___ Welding Survey (WE 111)	3
___ OxyFuel Gas Welding (WE 112)	2
___ Cutting Operations (WE 113)	2
___ Welding Methods (WE 114)	2
___ Shielded Arc Welding (WE 116)	3
___ Fundamentals of Welding I (WE 121)	3
___ Gas Tungsten Arc Welding (WE 215)	3

Spring

___ Blueprint Reading (Welding) (WE 119)	3
___ Fundamentals of Welding II (WE 122)	3
___ Automatic Arc & Inert Gas Welding (WE 212)	2
___ Pipe Welding and Fitting (WE 213)	2
___ Welding Problems (WE 216)	2
___ Gas Metal Arc Welding (MIG) (WE 219)	2
___ Metallurgy (WE 220)	3

Certificate requires 35 credit hours.

Welding Technology

Career Program
Certificate in Welding Technology
Credits Required: 35
Contact: Matt Galbraith, Lead Instructor, at 316.323.6824 or Becki Foster, Technical Advancement Director, at 316.322.3277

Recommendations

These classes are in high demand and fill quickly. Enrollment is limited.

Accreditation

Lead Instructor is an AWS Certified Welding Instructor.

Additional Costs/Tool Requirement

An additional \$25 lab fee is assessed to each program course and subject to change.

Prior to Admission

Students are required to take the ASSET test. Students must score a minimum of 37 Reading, 35 Writing, and 35 Numerical Math.

Recommended Course Sequence

Semester 1: WE 121, WE 112, WE 116, WE 113, WE 114, WE 111, WE 215 Semester 2: WE 122, WE 220, WE 119, WE 219, WE 216, WE 212, WE 213

After Butler

Recent graduates hold positions as welders, welding inspectors or supervisors, and welding sales representatives

Median Wage for Welders, Cutters, Solderers, and Brazers in South Central Kansas is \$30,905 per year. (Source: Workforce Planning Guide & Wage Survey, Local Area IV 2003 Edition, KDHR.)