

ENGINEERING/MANUFACTURING & INDUSTRIAL TECHNOLOGY PATHWAY

This pathway includes careers related to technologies necessary to design, develop, install or maintain physical systems. These may include engineering and related technologies, manufacturing technology, precision production and construction.

DEGREES/CERTIFICATES

- Automotive Service Technology
- Aviation Technology
- Climate Control Systems - heating, ventilation and air conditioning (HVAC)
- Customer Energy Specialist
- Electrician
- Electronic Technology/ELT
- Electronic Technology/Microcomputer Support
- Manufacturing Tech/Machining
- Manufacturing Tech/Maintenance
- Manufacturing Tech/Tool Room

TRANSFER PROGRAMS

The first two years of a student's college education usually consists of general study courses, introductory courses in a major and/or program of study, and selected electives. Refer to page 35 for additional information on transfer and MACRAO. Academic advisors assist students in planning their transfer program. They can also provide transfer guide sheets indicating JCC courses that meet the requirements of various programs of study at four-year colleges. Sample curricula for a few popular transfer programs are included.

- Pre-Architecture
- Engineering

Jackson Community College has published this catalog for information purposes only and its contents do not constitute a contract between this institution and prospective or enrolled students. The information contained in this general College catalog reflects the current curricula, policies and regulations of the College. However, these are subject to change at any time by action of the Board of Trustees or the administration. The information is generally believed to be accurate, but the College disclaims liability for inadvertent errors or omissions.

AUTOMOTIVE SERVICE TECHNOLOGY – ASSOCIATE IN APPLIED SCIENCE (AUTO.AAS)

Designed for the student preparing for a career in the automotive field. Classroom activities provide students an opportunity to learn theory and test-taking skills to successfully pass the Michigan and/or ASE certification examinations. Shop activities provide students an opportunity to become proficient in testing, diagnosing and servicing the various systems of the automobile. All eight areas of an automotive certification are thoroughly covered, and when combined with general and related courses, lead to an Associate in Applied Science degree. This provides the background for employment and advancement in various automotive related occupations such as service technician, service writer, service manager, proving grounds testing technician, shop owner, parts specialist, automotive machinist, alternate fuel vehicle technician, technical sales and motor sports.

As part of the Toyota Technical Education Network, our Toyota corporate-sponsored connection, students have the option to enter into the Toyota T-TEN program. This prepares students to work as a technician in a Toyota dealership. These students take the same automotive classes as other students with some important differences. T-TEN students must purchase an additional Toyota textbook for each course. Toyota provides T-TEN students with: Toyota work uniforms, web-based training materials, Toyota vehicles and special tools to work with in the shop, assistance in finding a sponsoring Toyota dealership to do paid co-ops, Toyota course exit exams and Toyota certification upon successful completion of the program.

As part of the Ford Maintenance and Light Repair network, our Ford corporate-sponsored connection, students have the option to enter into the Ford MLR program. This prepares students to work as a technician in Ford, Lincoln, or Mercury dealerships. These students take the same automotive classes as other students with some important differences. Ford MLR students concentrate on electrical systems, climate control, brakes, and suspension and steering. They utilize Ford training materials including service manuals, electrical/vacuum troubleshooting manuals, technical service bulletins, use Ford approved tools and equipment, work on Ford automobiles/light trucks, use Ford web-based training with exit tests. Upon successful completion of the courses, students are Ford certified with Service Technician Specialty Training credentials. With these credentials students will receive assistance in obtaining Ford, Lincoln, or Mercury dealership placement to work in the areas of certification.

Minimum credits:	63
Minimum cumulative GPA:	2.0
Minimum grade in all courses:	2.0
Minimum JCC AUT credits:	12
Minimum JCC credits:	12
MACRAO agreement:	No

GENERAL EDUCATION REQUIREMENTS - (16 credits)

ADO 1: Write clearly, concisely and intelligibly (3 credits)

Take the following:

ENG 131 Writing Experience

ADO 2: Speak clearly, concisely and intelligibly

Program courses meet this requirement

ADO 3: Demonstrate computational skills and mathematical reasoning (3-5 credits)**Choose one of the following:**

MTH 120 Beginning Algebra or higher

ADO 4: Demonstrate scientific reasoning (4-5 credits)**Choose one of the following:**

BIO 110 Introductory Biology

BIO 131 General Biology

BIO 132 Human Biology

BIO 155 Anatomy & Physiology

BIO 220 Microbiology

BIO 253 Human Anatomy and Physiology I

CEM 131 Fundamentals of Chemistry

CEM 141 General Chemistry I

GEL 160 Introduction to Geology

NSC 131 Contemporary Science

PHY 131 Conceptual Physics

PHY 151 Astronomy

PHY 231 College Physics I

PHY 251 Modern University Physics I

ADO 5: Understand human behavior and social systems, the principles which govern them, and their implications for the present and future (3-4 credits)**Choose one of the following:**

ECN 231 Macroeconomics

ECN 232 Microeconomics

HIS 131 Western Civilization to 1555

HIS 132 Western Civilization 1555 to Present

HIS 231 Development of the US through the Civil War

HIS 232 Development of the US from the Civil War

HIS 235 20th Century History

PLS 141 American National Government

PSY 140 Introduction to Psychology

SOC 231 Principles of Sociology

ADO 6: Understand aesthetic experience and artistic creativity (3 credits)**Choose one of the following:**

ART 111 Art History: Prehistoric to 1400

ART 112 Art History: Renaissance to Present

ENG 210 Introduction to Film

ENG 246 Short Story & Novel

ENG 247 Poetry & Drama

ENG 252 Shakespeare

ENG 254 Children's Literature

ENG 255 American Literature — 19th Century

ENG 256 American Literature — 20th Century

HUM 131 Cultural Connections

MUS 131 Understanding Music

THR 116 Introduction to Theatre

ADO 7: Think critically**Program courses meet this requirement****ADO 8: Make responsible decisions in personal and professional contexts**
Program courses meet this requirement**ADO 9: Work productively with others, recognizing individual contributions to group success****Program courses meet this requirement****ADO 10: Understand and respect the diversity and interdependence of the world's peoples and cultures****Program courses meet this requirement****AUTOMOTIVE SERVICE TECHNOLOGY RELATED REQUIREMENTS – (1 credit)**

FYS 110 Life Maps

AUTOMOTIVE SERVICE TECHNOLOGY CORE REQUIREMENTS - (42 credits)**Take the following:**

AUT 101 General Service

AUT 102 Engine Performance I

AUT 103 Engine Performance II

AUT 105 Automotive Brakes

AUT 106 Suspension & Steering

AUT 108 Automotive Air Conditioning /Heating

AUT 112 Electrical Systems I

AUT 113 Electrical Systems II

AUT 201 Engine Repair

AUT 202 Automatic Transmission

AUT 204 Manual Transmissions & Drivelines

AUT 210 Internship/Externship

AUT 234 Undercar Service

AUTOMOTIVE SERVICE TECHNOLOGY ELECTIVES - (4 credits)**Choose from the following:**

AUT 099 Jammin' Custom Cars

AUT 118 Diesel Fundamentals

AUT 119 Alternate Fuels

AUT 203 Advanced Engine Performance

AUT 211 Internship/Externship

AUT 212 Internship/Externship

AUT 214 Auto Lab Experience

AUT 240 Hybrid Technology

AUT 248 Diesel Engine Performance

AUTOMOTIVE SERVICE TECHNOLOGY – CERTIFICATE (AUTO.CERT)

Designed for the student preparing for a career in the automotive field. Classroom activities provide students an opportunity to learn theory and test-taking skills to successfully pass the Michigan and/or ASE certification examinations. Shop activities provide students an opportunity to become proficient in testing, diagnosing and servicing the various systems of the automobile. All eight areas of an automotive certification are thoroughly covered, and when combined with general and related courses, lead to an Associate in Applied Science degree.

Minimum credits:	49
Minimum cumulative GPA:	2.0
Minimum grade in all courses:	2.0
Minimum JCC credits:	12
Minimum AUT credits:	12
MACRAO agreement:	No

GENERAL EDUCATION REQUIREMENTS - (6 credits)

Take the following:

- ENG 131 Writing Experience
- MTH 120 Beginning Algebra or higher

AUTOMOTIVE SERVICE TECHNOLOGY RELATED REQUIREMENTS – (1 credit)

- FYS 110 Life Maps

AUTOMOTIVE SERVICE TECHNOLOGY CORE REQUIREMENTS – (42 credits)

Take the following:

- AUT 101 General Service
- AUT 105 Automotive Brakes
- AUT 106 Suspension & Steering
- AUT 102 Engine Performance I
- AUT 103 Engine Performance II
- AUT 108 Automotive Air Conditioning/Heating
- AUT 112 Electrical Systems I
- AUT 113 Electrical Systems II
- AUT 201 Engine Repair
- AUT 202 Automatic Transmission
- AUT 204 Manual Transmissions & Drivelines
- AUT 210 Internship/Externship
- AUT 234 Undercar Service

TOYOTA SERVICE – CERTIFICATE (TOSE.CERT)

Minimum credits:	51
Minimum cumulative GPA:	2.0
Minimum grade in all courses:	2.0
Minimum JCC credits:	12
MACRAO agreement:	No

GENERAL EDUCATION REQUIREMENTS - (6 credits)

- ENG 131 Writing Experience
- MTH 120 Beginning Algebra or higher

TOYOTA SERVICE RELATED REQUIREMENTS – (1 credit)

- FYS 110 Life Maps

REQUIRED COURSES – (44 credits)

Take the following:

- AUT 101 General Service
- AUT 102 Engine Performance I
- AUT 103 Engine Performance II
- AUT 105 Brakes
- AUT 106 Steering & Suspension

- AUT 108 Air Conditioning & Heating Systems
- AUT 112 Electrical Systems I
- AUT 113 Electrical Systems II
- AUT 201 Engine Repair
- AUT 202 Automatic Transmission
- AUT 204 Manual Transmission & Drivelines
- AUT 210 Internship/Externship
or AUT 211 Internship/Externship
- AUT 234 Undercar Service
- AUT 240 Hybrid Technology

DRIVEABILITY – CONCENTRATION (DRAB.CON)

Minimum credits:	22
Minimum cumulative GPA:	2.0
Minimum grade in all courses:	2.0
Minimum JCC credits:	12
MACRAO agreement:	No

REQUIRED COURSES – (21 credits)

Take the following:

- AUT 102 Engine Performance I
- AUT 103 Engine Performance II
- AUT 108 Automotive Air Conditioning/Heating
- AUT 112 Electrical Systems I
- AUT 113 Electrical Systems II
- AUT 210 Internship/Externship
- FYS 110 Life Maps

FORD SERVICE – CONCENTRATION (FOSE.CON)

Minimum credits:	22
Minimum cumulative GPA:	2.0
Minimum grade in all courses:	2.0
Minimum JCC credits:	12
MACRAO agreement:	No

REQUIRED COURSES – (21 credits)

Take the following:

- AUT 101 General Service
- AUT 105 Brakes
- AUT 106 Steering & Suspension
- AUT 108 Air Conditioning and Heating Systems
- AUT 112 Electrical Systems I
- AUT 113 Electrical Systems II
- AUT 234 Undercar Service
- AUT 240 Hybrid Technology
- FYS 110 Life Maps

HIGH SPEED DIESEL SERVICE – CONCENTRATION (HSDS.CON)

Minimum credits:	19
Minimum cumulative GPA:	2.0
Minimum grade in all courses:	2.0
Minimum JCC credits:	12
MACRAO agreement:	No

REQUIRED COURSES – (18 credits)

Take the following:

AUT 102 Engine Performance I
 AUT 103 Engine Performance II
 AUT 112 Electrical Systems I
 AUT 118 Diesel Fundamentals
 AUT 248 Diesel Engine Performance
 FYS 110 Life Maps

HYBRID VEHICLES – CONCENTRATION (HYVE.CON)

Minimum credits:	17
Minimum cumulative GPA:	2.0
Minimum grade in all courses:	2.0
Minimum JCC credits:	12
MACRAO agreement:	No

REQUIRED COURSES – (16 credits)

Take the following:

AUT 102 Engine Performance I
 AUT 103 Engine Performance II
 AUT 112 Electrical Systems I
 AUT 113 Electrical Systems II
 AUT 240 Hybrid Technology
 FYS 110 Life Maps

MAINTENANCE & LIGHT REPAIR – CONCENTRATION (MALR.CON)

Minimum credits:	20
Minimum cumulative GPA:	2.0
Minimum grade in all courses:	2.0
Minimum JCC credits:	12
MACRAO agreement:	No

REQUIRED COURSES – (19 credits)

Take the following:

AUT 105 Brakes
 AUT 106 Suspension & Steering
 AUT 108 Air Conditioning and Heating Systems
 AUT 112 Electrical Systems I
 AUT 113 Electrical Systems II
 AUT 210 Internship/Externship
 FYS 110 Life Maps

POWERTRAIN – CONCENTRATION (PWTR.CON)

Minimum credits:	18
Minimum cumulative GPA:	2.0
Minimum grade in all courses:	2.0
Minimum JCC credits:	12
MACRAO agreement:	No

REQUIRED COURSES – (18 credits)

Take the following:

AUT 201 Engine Repair
 AUT 202 Automatic Transmission
 AUT 204 Manual Transmissions & Drivelines
 AUT 210 Internship/Externship
 AUT 234 Undercar Service
 FYS 110 Life Maps

UNDERCAR SERVICES – CONCENTRATION (UCSR.CON)

Minimum credits:	18
Minimum cumulative GPA:	2.0
Minimum grade in all courses:	2.0
Minimum JCC credits:	12
MACRAO agreement:	No

REQUIRED COURSES – (18 credits)

Take the following:

AUT 101 General Service
 AUT 105 Automotive Brakes
 AUT 106 Suspension & Steering
 AUT 108 Auto Air Conditioning/Heating
 AUT 210 Internship/Externship
 AUT 234 Undercar Service
 FYS 110 Life Maps

WHEEL SERVICE – CONCENTRATION (WHSR.CON)

Minimum credits:	18
Minimum cumulative GPA:	2.0
Minimum grade in all courses:	2.0
Minimum JCC credits:	12
MACRAO agreement:	No

REQUIRED COURSES – (17 credits)

Take the following:

AUT 101 General Service
 AUT 105 Automotive Brakes
 AUT 106 Suspension & Steering
 AUT 112 Electrical Systems I
 AUT 210 Internship/Externship
 AUT 234 Undercar Service
 FYS 110 Life Maps

HIGH SPEED DIESEL SERVICE – SKILL SET (HSDS.SSET)

Minimum credits:	5
Minimum cumulative GPA:	2.0
Minimum grade in all courses:	2.0
Minimum JCC credits:	5
MACRAO agreement:	No

REQUIRED COURSES – (5 credits)

Take the following:

- AUT 118 Diesel Fundamentals
- AUT 248 Diesel Engine Performance
- FYS 110 Life Maps

HYBRID VEHICLES – SKILL SET (HYVE.SSET)

Minimum credits:	10
Minimum cumulative GPA:	2.0
Minimum grade in all courses:	2.0
Minimum JCC credits:	10
MACRAO agreement:	No

REQUIRED COURSES – (10 credits)

Take the following:

- AUT 102 Engine Performance I
- AUT 112 Electrical Systems I
- AUT 240 Hybrid Technology
- FYS 110 Life Maps

MAINTENANCE & LIGHT REPAIR – SKILL SET (MALR.SSET)

Minimum credits:	16
Minimum cumulative GPA:	2.0
Minimum grade in all courses:	2.0
Minimum JCC credits:	16
MACRAO agreement:	No

REQUIRED COURSES – (16 credits)

Take the following:

- AUT 105 Brakes
- AUT 106 Steering & Suspension
- AUT 108 Air Conditioning and Heating Systems
- AUT 112 Electrical Systems I
- AUT 113 Electrical Systems II
- FYS 110 Life Maps

AIR CONDITIONING and HEATING – SKILL SET (ACAH.SSET)

Minimum credits:	10
Minimum cumulative GPA:	2.0
Minimum grade in all courses:	2.0
Minimum JCC credits:	10
MACRAO agreement:	No

REQUIRED COURSES – (10 credits)

Take the following:

- AUT 108 Air Conditioning & Heating Systems
- AUT 112 Electrical Systems I
- AUT 113 Electrical Systems II
- FYS 110 Life Maps

AVIATION FLIGHT TECHNOLOGY – ASSOCIATE IN APPLIED SCIENCE (AVFT.AAS)

Basic ground school and flight instruction needed to meet the requirements of the Federal Aviation Administration’s Commercial Pilot certificate with instrument and flight instructor ratings. * Federal and/or Michigan law may require that enrollees in the aviation program undergo an FBI background check. Contact the director of aviation with questions.

Minimum credits:	63
Minimum cumulative GPA:	2.0
Minimum grade in all courses:	2.0
Minimum JCC credits:	12
MACRAO agreement:	No

GENERAL EDUCATION REQUIREMENTS – (21 credits)

ADO 1: Write clearly, concisely and intelligibly (3 credits)

Take the following:

- ENG 131 Writing Experience

ADO 2: Speak clearly, concisely and intelligibly (3 credits)

Choose one of the following:

- COM 231 Communication Fundamentals
- COM 240 Interpersonal Communication

ADO 3: Demonstrate computational skills and mathematical reasoning (3-5 credits)

Take the following:

- MTH 131 Intermediate Algebra or higher

ADO 4: Demonstrate scientific reasoning (4 credits)

Take the following:

- PHY 231 College Physics I

ADO 5: Understand human behavior and social systems, the principles which govern them, and their implications for the present and future (4 credits)

- PSY 140 Introduction to Psychology

ADO 6: Understand aesthetic experience and artistic creativity (3 credits)

Choose one of the following:

- ART 111 Art History: Prehistoric to 1400
- ART 112 Art History: Renaissance to Present
- ENG 210 Introduction to Film
- ENG 246 Short Story & Novel
- ENG 247 Poetry & Drama
- ENG 252 Shakespeare
- ENG 254 Children’s Literature
- ENG 255 American Literature – 19th Century

ENG 256 American Literature – 20th Century
 HUM 131 Cultural Connections
 MUS 131 Understanding Music
 THR 116 Introduction to Theatre

ADO 7: Think critically

Program courses meet this requirement

ADO 8: Make responsible decisions in personal and professional contexts (1-3 credits)

Choose one of the following:

HPF 160 Wellness
 HPF 277 Stress Management
 HPF 283 Managing Stress and Holistic Health
 PHL 236 Ethics

ADO 9: Work productively with others, recognizing individual contributions to group success

Program courses meet this requirement

ADO 10: Understand and respect the diversity and interdependence of the world’s peoples and cultures

Program courses meet this requirement

AVIATION FLIGHT TECHNOLOGY RELATED REQUIREMENTS – (7 credits)

Take the following:

CIS 101 Introduction to Computer Systems
 FYS 110 Life Maps
 MTH 133 Introduction to Probability & Statistics

AVIATION FLIGHT TECHNOLOGY CORE REQUIREMENTS – (35 credits)

Take the following:

AFT 100 Basic Maneuvers
 AFT 110 Primary Ground School
 AFT 115 Primary Flight I
 AFT 120 Primary Flight II
 AFT 125 Commercial Ground School
 AFT 130 Commercial Flight I
 AFT 135 Instrumental Ground School
 AFT 140 Commercial Flight II
 AFT 200 Commercial Flight III
 AFT 205 Commercial Flight IV

**All enrollees must be capable of attaining the FAA class II medical certificate.*

CLIMATE CONTROL TECHNOLOGY – ASSOCIATE IN APPLIED SCIENCE (CLCS.AAS)

Provides skills required for heating, air conditioning and refrigeration. Training areas include application techniques for basic and advanced air conditioning, heat pumps, fossil fuels, solar energy and refrigeration.

Minimum credits:	60
Minimum cumulative GPA:	2.0
Minimum grade in all courses:	2.0
Minimum JCC credits:	12
MACRAO agreement:	No

GENERAL EDUCATION REQUIREMENTS – (23 credits)

ADO 1: Write clearly, concisely and intelligibly (6 credits)

Take the following:

ENG 131 Writing Experience
 ENG 232 Technical & Business Writing

ADO 2: Speak clearly, concisely and intelligibly (3 credits)

Choose one of the following:

COM 231 Communication Fundamentals
 COM 240 Interpersonal Communication

ADO 3: Demonstrate computational skills and mathematical reasoning (3-5 credits)

Take the following:

MTH 120 Beginning Algebra or higher

ADO 4: Demonstrate scientific reasoning (4-5 credits)

Choose one of the following:

BIO 110 Introductory Biology
 BIO 131 General Biology
 BIO 132 Human Biology
 BIO 155 Anatomy & Physiology
 BIO 220 Microbiology
 BIO 253 Human Anatomy and Physiology I
 CEM 131 Fundamentals of Chemistry
 CEM 141 General Chemistry I
 GEL 160 Introduction to Geology
 NSC 131 Contemporary Science
 PHY 131 Conceptual Physics
 PHY 151 Astronomy
 PHY 231 College Physics I
 PHY 251 Modern University Physics I

ADO 5: Understand human behavior and social systems, the principles which govern them and their implications for the present and future (3-4 credits)

Choose one of the following:

ECN 231 Macroeconomics
 ECN 232 Microeconomics
 HIS 131 Western Civilization to 1555
 HIS 132 Western Civilization 1555 to Present
 HIS 231 Development of the US through the Civil War
 HIS 232 Development of the US from the Civil War
 HIS 235 20th Century History
 PLS 141 American National Government
 PSY 140 Introduction to Psychology
 SOC 231 Principles of Sociology

ADO 6: Understand aesthetic experience and artistic creativity (3 credits)

Choose one of the following:

ART 111 Art History: Prehistoric to 1400
 ART 112 Art History: Renaissance to Present
 ENG 210 Introduction to Film
 ENG 246 Short Story & Novel
 ENG 247 Poetry & Drama
 ENG 252 Shakespeare
 ENG 254 Children’s Literature

ENG 255 American Literature – 19th Century
 ENG 256 American Literature – 20th Century
 HUM 131 Cultural Connections
 MUS 131 Understanding Music
 THR 116 Introduction to Theatre

ADO 7: Think critically

Program courses meet this requirement

ADO 8: Make responsible decisions in personal and professional contexts (1-3 credits)

Choose one of the following:

HPF 160 Wellness
 HPF 277 Stress Management
 HPF 283 Managing Stress and Holistic Health
 PHL 236 Ethics

ADO 9: Work productively with others, recognizing individual contributions to group success

Program courses meet this requirement

ADO 10: Understand and respect the diversity and interdependence of the world's peoples and cultures

Program courses meet this requirement

CLIMATE CONTROL TECHNOLOGY RELATED REQUIREMENTS – (4 credits)

Take the following:

FYS 110 Life Maps

And choose one of the following:

BUA 120 Human Relations in Business
 CIS 101 Introduction to Computer Systems

CLIMATE CONTROL TECHNOLOGY CORE REQUIREMENTS – (27 credits)

Take the following:

CCT 117 Beginning Sheet Metal
 CCT 118 Advanced Sheet Metal
 CCT 121 Introduction to HVAC
 CCT 123 Application of HVAC Technology
 CCT 131 Basic HVAC Electrical/Controls
 CCT 135 Basic Refrigeration & Air Conditioning I
 CCT 136 Basic Refrigeration & Air Conditioning II
 CCT 137 Advanced HVAC Electrical/Controls
 CCT 141 Basic Heating
 CCT 142 Advanced Heating
 CCT 200 Mechanical Code
 CCT 201 Refrigeration Certification

CLIMATE CONTROL TECHNOLOGY ADDITIONAL REQUIREMENTS

EMS 110 CPR & First Aid or current Adult CPR & First Aid Certification

ELECTIVES – (1-7 credits)

Select electives from courses (except those with prefixes CED, CEU, CFO, CSS and ESL) so that degree equals 60 credits.

CLIMATE CONTROL TECHNOLOGY – CERTIFICATE (CLCS.CERT)

Climate control technology curriculum provides skills required for heating, air conditioning and refrigeration. Training areas include application techniques for basic and advanced air conditioning, heat pumps, fossil fuels, solar energy and refrigeration.

Minimum credits:	37
Minimum cumulative GPA:	2.0
Minimum grade in all courses:	2.0
Minimum JCC credits:	12
MACRAO agreement:	No

GENERAL EDUCATION REQUIREMENTS – (9 credits)

Take the following:

ENG 131 Writing Experience
 ENG 232 Technical & Business Writing
 MTH 120 Beginning Algebra or higher

CLIMATE CONTROL TECHNOLOGY RELATED REQUIREMENTS – (1 credits)

Take the following:

FYS 110 Life Maps

CLIMATE CONTROL TECHNOLOGY CORE REQUIREMENTS – (27 credits)

Take the following:

CCT 117 Beginning Sheet Metal
 CCT 118 Advanced Sheet Metal
 CCT 121 Introduction to HVAC
 CCT 123 Application of HVAC Technology
 CCT 131 Basic HVAC Electricity/Controls
 CCT 135 Refrigeration & Air Conditioning I
 CCT 136 Refrigeration & Air Conditioning II
 CCT 137 Advanced HVAC Electricity/Controls
 CCT 141 Basic Heating
 CCT 142 Advanced Heating
 CCT 200 Mechanical Code
 CCT 201 Refrigeration Certification

ADDITIONAL REQUIREMENTS

EMS 110 CPR & First Aid or current Adult CPR and First Aid Certification

This suggested course sequence is ONLY for students starting this program in the Fall semester. Because this program is set up for the student to be able to complete in one year, a student would need to begin in the Fall semester to complete all the prerequisites required for the Winter semester courses.

CUSTOMER ENERGY SPECIALIST – CERTIFICATE (CUES.CERT)

This program is designed to provide students with the competencies, knowledge and skills to function as a beginning Customer Energy Specialist for Consumers Energy. Completion does not guarantee employment.

Minimum credits:	48
Minimum cumulative GPA:	2.0
Minimum grade in all courses:	2.0
Minimum JCC credits:	12
MACRAO agreement:	No

GENERAL EDUCATION REQUIREMENTS – (16 credits)**Take the following:**

COM 231 Communication Fundamentals
 ENG 131 Writing Experience
 ENG 232 Technical & Business Writing
 MTH 120 Beginning Algebra or higher
 PHY131 Conceptual Physics

RELATED CONSUMER ENERGY SPECIALIST REQUIREMENTS – (17 credits)**Take the following:**

ACC 216 Financial Accounting Concepts
 or ACC 231 Principles of Accounting I
 BUA 230 Principles of Marketing
 or BUA 100 Contemporary Business
 BUA 121 Leadership
 or BUA 120 Human Relations in Business
 BUA 250 Business Law I
 CIS 101 Introduction to Computer Systems
 FYS 110 Life Maps

CONSUMER ENERGY SPECIALIST CORE REQUIREMENTS – (13 credits)**Take the following:**

CAD 131 Computer Assisted Drafting I (AutoCAD)
 CAD 132 Computer Assisted Drafting II (AutoCAD)
 ELT 120 Circuit Analysis I
 ELT 125 Circuit Analysis II

ELECTIVES

Choose from the following disciplines: BIO, CEM, EGR, GEO, NSC, CPS, CIS or choose from the following courses: ELT 150, ELT 152, ELT 215 or from any additional MTH course at a higher level than used for the general education requirement to meet the 48 credits required for the certificate.

ELECTRICIAN – ASSOCIATE IN APPLIED SCIENCE (ELEC.AAS)

Minimum credits:	63
Minimum cumulative GPA:	2.0
Minimum grade in all courses:	2.0
Minimum JCC credits:	12
MACRAO agreement:	No

GENERAL EDUCATION REQUIREMENTS – (20 credits)**ADO 1: Write clearly, concisely and intelligibly – (3 credits)****Take the following:**

ENG 131 Writing Experience

ADO 2: Speak clearly, concisely and intelligibly – (3 credits)**Choose one of the following:**

COM 231 Communication Fundamentals
 COM 240 Interpersonal Communication

ADO 3: Demonstrate computational skills and mathematical reasoning (3-5 credits)**Take the following:**

MTH 120 Beginning Algebra or higher

ADO 4: Demonstrate scientific reasoning (4-5 credits)**Choose one of the following:**

BIO 110 Introductory Biology
 BIO 131 General Biology
 BIO 132 Human Biology
 BIO 155 Anatomy & Physiology
 BIO 220 Microbiology
 BIO 253 Human Anatomy and Physiology I
 CEM 131 Fundamentals of Chemistry
 CEM 141 General Chemistry I
 GEL 160 Introduction to Geology
 NSC 131 Contemporary Science
 PHY 131 Conceptual Physics
 PHY 151 Astronomy
 PHY 231 College Physics I
 PHY 251 Modern University Physics I

ADO 5: Understand human behavior and social systems, the principles which govern them, and their implications for the present and future (3-4 credits)**Choose one of the following:**

ECN 231 Macroeconomics
 ECN 232 Microeconomics
 HIS 131 Western Civilization to 1555
 HIS 132 Western Civilization 1555 to Present
 HIS 231 Development of the US through the Civil War
 HIS 232 Development of the US from the Civil War
 HIS 235 20th Century History
 PLS 141 American National Government
 PSY 140 Introduction to Psychology
 SOC 231 Principles of Sociology

ADO 6: Understand aesthetic experience and artistic creativity (3 credits)**Choose one of the following:**

ART 111 Art History: Prehistoric to 1400
 ART 112 Art History: Renaissance to Present
 ENG 210 Introduction to Film
 ENG 246 Short Story & Novel
 ENG 247 Poetry & Drama
 ENG 252 Shakespeare
 ENG 254 Children's Literature
 ENG 255 American Literature – 19th Century
 ENG 256 American Literature – 20th Century
 HUM 131 Cultural Connections
 MUS 131 Understanding Music
 THR 116 Introduction to Theatre

ADO 7: Think critically

Program courses meet this requirement

ADO 8: Make responsible decisions in personal and professional contexts (1-3 credits)**Choose one of the following:**

HPF 160 Wellness
 HPF 277 Stress Management

HPF 283 Managing Stress and Holistic Health
 PHL 236 Ethics

ADO 9: Work productively with others, recognizing individual contributions to group success

Program courses meet this requirement

ADO 10: Understand and respect the diversity and interdependence of the world's peoples and cultures

Program courses meet this requirement

ELECTRICIAN RELATED REQUIREMENTS – (1 credit)

Take the following:

FYS 110 Life Maps

ELECTRICIAN CORE REQUIREMENTS – (42 credits)

Take the following:

- ELT 074 National Electric Code
- ELT 120 Circuit Analysis I
- ELT 125 Circuit Analysis II
- ELT 130 Electronics I
- ELT 140 Introduction to Digital Electronics
- ELT 148 Electrical Math I
- ELT 149 Electrical Math II
- ELT 150 Residential Wiring
- ELT 151 Commercial Wiring
- ELT 152 Industrial Wiring
- ELT 215 Electrical Troubleshooting
- ELT 220 Industrial Motion Control
- ELT 250 Electrical Motors & Controls
- ELT 260 Basic Programmable Controllers
- ELT 265 SLC 500 Programming and Troubleshooting

ADDITIONAL REQUIREMENTS

EMS 110 CPR & First Aid or current Adult CPR and First Aid Certification

ELECTRICIAN – CERTIFICATE (ELEC.CERT)

Minimum credits:	47
Minimum cumulative GPA:	2.0
Minimum grade in all courses:	2.0
Minimum JCC credits:	12
MACRAO agreement:	No

GENERAL EDUCATION REQUIREMENTS – (6 credits)

Take the following:

- ENG 131 Writing Experience
- MTH 120 Beginning Algebra or higher

ELECTRICIAN RELATED REQUIREMENTS – (1 credits)

Take the following:

FYS 110 Life Maps

ELECTRICIAN CORE REQUIREMENTS – (40 credits)

Take the following:

- ELT 074 National Electric Code
- ELT 120 Circuit Analysis I

- ELT 125 Circuit Analysis II
- ELT 130 Electronics I
- ELT 140 Introduction to Digital Electronics
- ELT 148 Electrical Math I
- ELT 149 Electrical Math II
- ELT 150 Residential Wiring
- ELT 151 Commercial Wiring
- ELT 152 Industrial Wiring
- ELT 215 Electrical Troubleshooting
- ELT 220 Industrial Motion Control
- ELT 250 Electrical Motors & Controls
- ELT 260 Basic Programmable Controllers

ADDITIONAL REQUIREMENTS

EMS 110 CPR & First Aid or current Adult CPR and First Aid Certification

ELECTRICAL BASICS – CONCENTRATION (ELEC.CON)

Completion of this program provides solid electrical foundation for the person seeking electrical or industrial maintenance mechanic training.

Minimum credits:	18
Minimum cumulative GPA:	2.0
Minimum grade in all courses:	2.0
Minimum JCC credits:	12
MACRAO agreement:	No

REQUIRED COURSES – (18 credits)

Take the following:

- ELT 120 Circuit Analysis I
- ELT 125 Circuit Analysis II
- ELT 150 Residential Wiring
- ELT 152 Industrial Wiring
- ELT 148 Electrical Math I
- ELT 260 Basic Programmable Controllers
- FYS 110 Life Maps

ELECTRONIC TECHNOLOGY/ELT – ASSOCIATE IN APPLIED SCIENCE (ETGE.AAS)

Electronic technologists are employed in such fields as digital computer maintenance, voice and data communications, radio and television broadcasting, medical electronic instrumentation, high-tech manufacturing, research and development in laboratory settings. Students may also work to achieve A+ certification for employment as personal computer service professionals. A+ certification is the "journeyman's card" for computer technologists, which is recognized by CompTIA. The non-profit Computing Technology Industry Association (CompTIA) is widely recognized as the standard for qualified computer service professionals.

Minimum credits:	65
Minimum cumulative GPA:	2.0
Minimum grade in all courses:	2.0
Minimum JCC credits:	12
MACRAO agreement:	No

GENERAL EDUCATION REQUIREMENTS – (21 credits)**ADO 1: Write clearly, concisely and intelligibly (3 credits)****Take the following:**

ENG 131 Writing Experience

ADO 2: Speak clearly, concisely and intelligibly (3 credits)**Choose one of the following:**

COM 231 Communication Fundamentals

COM 240 Interpersonal Communication

ADO 3: Demonstrate computational skills and mathematical reasoning (3-5 credits)**Take the following:**

MTH 131 Intermediate Algebra or higher

ADO 4: Demonstrate scientific reasoning (4-5 credits)**Choose one of the following:**

BIO 110 Introductory Biology

BIO 131 General Biology

BIO 132 Human Biology

BIO 155 Human Anatomy & Physiology

BIO 220 Microbiology

BIO 253 Human Anatomy and Physiology I

CEM 131 Fundamentals of Chemistry

CEM 141 General Chemistry I

GEL 160 Introduction to Geology

NSC 131 Contemporary Science

PHY 131 Conceptual Physics

PHY 151 Astronomy

PHY 231 College Physics I

PHY 251 Modern University Physics I

ADO 5: Understand human behavior and social systems, the principles which govern them, and their implications for the present and future (3-4 credits)**Choose one of the following:**

ECN 231 Macroeconomics

ECN 232 Microeconomics

HIS 131 Western Civilization to 1555

HIS 132 Western Civilization 1555 to Present

HIS 231 Development of the US through the Civil War

HIS 232 Development of the US from the Civil War

HIS 235 20th Century History

PLS 141 American National Government

PSY 140 Introduction to Psychology

SOC 231 Principles of Sociology

ADO 6: Understand aesthetic experience and artistic creativity (3 credits)**Choose one of the following:**

ART 111 Art History: Prehistoric to 1400

ART 112 Art History: Renaissance to Present

ENG 210 Introduction to Film

ENG 246 Short Story & Novel

ENG 247 Poetry & Drama

ENG 252 Shakespeare

ENG 254 Children's Literature

ENG 255 American Literature – 19th Century

ENG 256 American Literature – 20th Century

HUM 131 Cultural Connections

MUS 131 Understanding Music

THR 116 Introduction to Theatre

ADO 7: Think critically

Program courses meet this requirement

ADO 8: Make responsible decisions in personal and professional contexts (1-3 credits)**Choose one of the following:**

HPF 160 Wellness

HPF 277 Stress Management

HPF 283 Managing Stress and Holistic Health

PHL 236 Ethics

ADO 9: Work productively with others, recognizing individual contributions to group success

Program courses meet this requirement

ADO 10: Understand and respect the diversity and interdependence of the world's peoples and cultures

Program courses meet this requirement

ELECTRONIC TECHNOLOGY RELATED REQUIREMENTS – (8 credits)**Take the following:**

FYS 110 Life Maps

And choose either Transfer or Non-Transfer:**For Transfer group take the following:**

CIS 170 Programming C++

or CIS 160 Programming in Visual Basic.NET

MTH 151 Calculus I

For Non-Transfer group take the following:

CIS 170 Programming C++

or CIS 160 Programming in Visual Basic.NET

Plus up to 4 credits from the following:

Any ELT or CIS course that best meets your educational goals

ELECTRONIC TECHNOLOGY CORE REQUIREMENTS – (36 credits)**Take the following:**

CIS 101 Introduction to Computer Systems

CIS 174 PC Repair/A+ Hardware Component

CIS 175 PC Repair/A+ Software Component

CIS 176 A+ Certification Exam Preparation

CIS 177 Network+/Networking Fundamentals

ELT 120 Circuit Analysis I

ELT 125 Circuit Analysis II

ELT 130 Electronics I

ELT 140 Introduction to Digital Electronics

ELT 250 Electric Motors & Controls

ELT 260 Basic Programmable Controllers

ELECTRONIC TECHNOLOGY/ELT – CERTIFICATE (ELTE.CERT)

Minimum credits:	35
Minimum cumulative GPA:	2.0
Minimum grade in all courses:	2.0
Minimum JCC credits:	12
MACRAO agreement:	No

GENERAL EDUCATION REQUIREMENTS – (6 credits)

Take the following:

- ENG 131 Writing Experience
- MTH 131 Intermediate Algebra or higher

RELATED REQUIREMENTS – (4 credits)

Take the following:

- FYS 110 Life Maps

And choose one from the following:

- CIS 160 Programming in Visual Basic.NET
- ELT 250 Electric Motors & Controls
- ELT 260 Basic Programmable Controllers
- ELT 280 Digital Systems

ELECTRONIC TECHNICIAN CORE REQUIREMENTS – (25 credits)

Take the following:

- CIS 101 Introduction to Computer Systems
- CIS 174 PC Repair/A+ Hardware Component
- CIS 175 PC Repair/A+ Software Component
- CIS 176 A+ Certification Exam Preparation
- ELT 120 Circuit Analysis I
- ELT 125 Circuit Analysis II
- ELT 130 Electronics I
- ELT 140 Introduction to Digital Electronics

ELECTRONIC TECHNOLOGY/MICROCOMPUTER – ASSOCIATE IN APPLIED SCIENCE (ETMS.AAS)

Electronic technologists are employed in such fields as digital computer maintenance, voice and data communications, radio and television broadcasting, medical electronic instrumentation, high-tech manufacturing, research and development in laboratory settings. Students may also work to achieve A+ certification for employment as personal computer service professionals. A+ certification is the “journeyman’s card” for computer technologists, which is recognized by CompTIA. The non-profit Computing Technology Industry Association (CompTIA) is widely recognized as the standard for qualified computer service professionals.

Minimum credits:	62
Minimum cumulative GPA:	2.0
Minimum grade in all courses:	2.0
Minimum JCC credits:	12
MACRAO agreement:	No

GENERAL EDUCATION REQUIREMENTS – (21 credits)

ADO 1: Write clearly, concisely and intelligibly (3 credits)

Take the following:

- ENG 131 Writing Experience

ADO 2: Speak clearly, concisely and intelligibly (3 credits)

Take the following:

- COM 240 Interpersonal Communication

ADO 3: Demonstrate computational skills and mathematical reasoning (3-5 credits)

Take the following:

- MTH 120 Beginning Algebra or higher

ADO 4: Demonstrate scientific reasoning (4-5 credits)

Choose one of the following:

- BIO 110 Introductory Biology
- BIO 131 General Biology
- BIO 132 Human Biology
- BIO 155 Human Anatomy & Physiology
- BIO 220 Microbiology
- BIO 253 Human Anatomy and Physiology I
- CEM 131 Fundamentals of Chemistry
- CEM 141 General Chemistry I
- GEL 160 Introduction to Geology
- NSC 131 Contemporary Science
- PHY 131 Conceptual Physics
- PHY 151 Astronomy
- PHY 231 College Physics I
- PHY 251 Modern University Physics I

ADO 5: Understand human behavior and social systems, the principles which govern them, and their implications for the present and future (3-4 credits)

Choose one of the following:

- ECN 231 Macroeconomics
- ECN 232 Microeconomics
- HIS 131 Western Civilization to 1555
- HIS 132 Western Civilization 1555 to Present
- HIS 231 Development of the US through the Civil War
- HIS 232 Development of the US from the Civil War
- HIS 235 20th Century History
- PLS 141 American National Government
- PSY 140 Introduction to Psychology
- SOC 231 Principles of Sociology

ADO 6: Understand aesthetic experience and artistic creativity (3 credits)

Choose one of the following:

- ART 111 Art History: Prehistoric to 1400
- ART 112 Art History: Renaissance to Present
- ENG 210 Introduction to Film
- ENG 246 Short Story & Novel
- ENG 247 Poetry & Drama
- ENG 252 Shakespeare
- ENG 254 Children’s Literature
- ENG 255 American Literature – 19th Century
- ENG 256 American Literature – 20th Century

HUM 131 Cultural Connections
 MUS 131 Understanding Music
 THR 116 Introduction to Theatre

ADO 7: Think critically

Program courses meet this requirement

ADO 8: Make responsible decisions in personal and professional contexts (1-3 credits)

Choose one of the following:

HPF 160 Wellness
 HPF 277 Stress Management
 HPF 283 Managing Stress and Holistic Health
 PHL 236 Ethics

ADO 9: Work productively with others, recognizing individual contributions to group success

Program courses meet this requirement

ADO 10: Understand and respect the diversity and interdependence of the world's peoples and cultures

Program courses meet this requirement

MICROCOMPUTER RELATED REQUIREMENTS – (8 credits)

Take the following:

CIS 170 Programming in C++
 FYS 110 Life Maps

And choose 4 credits from the following:

Any ELT or CIS course that best meets your educational goals.

MICROCOMPUTER CORE REQUIREMENTS – (33 credits)

Take the following:

BUA 120 Human Relations in Business
 CIS 012 Windows® Workshop
 CIS 013 Operating Systems: UNIX
 CIS 016 Microsoft® DOS® Workshop
 CIS 101 Introduction to Computer Systems
 CIS 160 Programming in Visual Basic.Net
 CIS 174 PC Repair/A+ Hardware Component
 CIS 175 PC Repair/A+ Software
 CIS 176 A+ Certification Exam Preparation
 CIS 177 Network+/Networking Fundamentals
 CIS 179 Network+ Certification Exam Preparation
 ELT 119 DC Fundamentals
 ELT 124 AC Fundamentals
 ELT 129 Semiconductor Devices
 ELT 139 Digital Electronic Fundamentals

**ELECTRONIC TECHNOLOGY/
 MICROCOMPUTER – CERTIFICATE
 (ETMS.CERT)**

Minimum credits: 36
 Minimum cumulative GPA: 2.0
 Minimum grade in all courses: 2.0
 Minimum JCC credits: 12
 MACRAO agreement: No

GENERAL EDUCATION REQUIREMENTS – (6 credits)

Take the following:

ENG 131 Writing Experience
 MTH 131 Intermediate Algebra or higher

RELATED REQUIREMENTS – (4 credits)

Take the following:

FYS 110 Life Maps
 And choose one of the following:
 CIS 160 Programming in Visual Basic.NET
 ELT 250 Electric Motors & Controls
 ELT 260 Basic Programmable Controllers
 ELT 280 Digital Systems

MICROCOMPUTER CORE REQUIREMENTS – (26 credits)

Take the following:

CIS 012 Windows® Workshop
 CIS 013 Operating Systems: UNIX
 CIS 016 Microsoft® DOS® Workshop
 CIS 101 Introduction to Computer Systems
 CIS 174 PC Repair/A+ Hardware Component
 CIS 175 PC Repair/A+ Software Component
 CIS 176 A+ Certification Exam Preparation
 CIS 177 Network+/Networking Fundamentals
 ELT 119 DC Fundamentals
 ELT 124 AC Fundamentals
 ELT 129 Semiconductor Devices
 ELT 139 Digital Electronic Fundamentals

**MANUFACTURING TECH / MACHINING
 – ASSOCIATE IN APPLIED SCIENCE
 (MAMA.AAS)**

This Associate in Applied Science degree program is designed to provide the theoretical knowledge and the hands-on experience necessary to be successful in the increasingly technical area of manufacturing and/or production machining. Many of the courses in this curriculum coincide with the Academy for Manufacturing Careers BAT certificate program making this an ideal continuation after completion of your journeyman's certificate.

Minimum credits: 63
 Minimum cumulative GPA: 2.0
 Minimum grade in all courses: 2.0
 Minimum JCC credits: 12
 MACRAO agreement: No

GENERAL EDUCATION REQUIREMENTS – (24 credits)

ADO 1: Write clearly, concisely and intelligibly (6 credits)

Take the following:

ENG 131 Writing Experience
 ENG 232 Technical & Business Writing

ADO 2: Speak clearly, concisely and intelligibly (3 credits)

Choose one of the following:

COM 231 Communication Fundamentals
 COM 240 Interpersonal Communication

ADO 3: Demonstrate computational skills and mathematical reasoning (3-5 credits)

Take the following:

MTH 120 Beginning Algebra or higher

ADO 4: Demonstrate scientific reasoning (4-5 credits)

Choose one of the following:

- BIO 110 Introductory Biology
- BIO 131 General Biology
- BIO 132 Human Biology
- BIO 155 Anatomy & Physiology
- BIO 220 Microbiology
- BIO 253 Human Anatomy and Physiology I
- CEM 131 Fundamentals of Chemistry
- CEM 141 General Chemistry I
- GEL 160 Introduction to Geology
- NSC 131 Contemporary Science
- PHY 131 Conceptual Physics
- PHY 151 Astronomy
- PHY 231 College Physics I
- PHY 251 Modern University Physics I

ADO 5: Understand human behavior and social systems, the principles which govern them, and their implications for the present and future (3-4 credits)

Choose one of the following:

- ECN 231 Macroeconomics
- HIS 131 Western Civilization to 1555
- HIS 132 Western Civilization 1555 to Present
- HIS 231 Development of the US through the Civil War
- HIS 232 Development of the US from the Civil War
- HIS 235 20th Century History
- PSY 140 Introduction to Psychology
- SOC 231 Principles of Sociology

ADO 6: Understand aesthetic experience and artistic creativity (3 credits)

Choose one of the following:

- ART 111 Art History: Prehistoric to 1400
- ART 112 Art History: Renaissance to Present
- ENG 210 Introduction to Film
- ENG 246 Short Story & Novel
- ENG 247 Poetry & Drama
- ENG 252 Shakespeare
- ENG 255 American Literature – 19th Century
- ENG 256 American Literature – 20th Century
- HUM 131 Cultural Connections
- MUS 131 Understanding Music
- THR 116 Introduction to Theatre

ADO 7: Think critically

Program courses meet this requirement

ADO 8: Make responsible decisions in personal and professional contexts (1-3 credits)

Choose one of the following:

- HPF 160 Wellness
- HPF 277 Stress Management

- HPF 283 Managing Stress and Holistic Health
- PHL 236 Ethics

ADO 9: Work productively with others, recognizing individual contributions to group success

Program courses meet this requirement

ADO 10: Understand and respect the diversity and interdependence of the world's peoples and cultures

Program courses meet this requirement

MFG TECH RELATED REQUIREMENTS – (7 credits)

Take the following:

- ECN 232 Microeconomics
- FYS 110 Life Maps
- PLS 141 American National Government

MFG TECH MACHINING RELATED REQUIREMENTS – (32 credits)

Take the following:

- MFG 005 Technical Problem Solving
- MFG 025 Basic Computer Skills
- MFG 060 Geometry for Manufacturing
- MFG 065 Trigonometry for Manufacturing
- MFG 105 Blueprint Reading
- MFG 115 GD and T
- MFG 150 Machining Theory & Methods
- MFG 155 Machinery Handbook
- MFG 160 Materials/Metallurgy
- MFG 165 Precision Machining Methods
- MFG 175 CNC Theory & Programming
- MFG 180 EDM Theory
- MFG 200 Basic Gauges & Measurement

MANUFACTURING TECH / MAINTENANCE – ASSOCIATE IN APPLIED SCIENCE (MAMT.AAS)

This Associate in Applied Science degree program is designed to provide the theoretical knowledge and the hands-on experience necessary to be successful in the increasingly technical area of manufacturing and/or industrial maintenance. Many of the courses in this curriculum coincide with the Academy for Manufacturing Careers BAT certificate program making this an ideal continuation after completion of your journeyman's certificate.

Minimum credits:	61
Minimum cumulative GPA:	2.0
Minimum grade in all courses:	2.0
Minimum JCC credits:	12
MACRAO agreement:	No

GENERAL EDUCATION PREREQUISITE REQUIREMENTS – (23 credits)

ADO 1: Write clearly, concisely and intelligibly (6 credits)

Take the following:

- ENG 131 Writing Experience
- ENG 232 Technical & Business Writing

ADO 2: Speak clearly, concisely and intelligibly (3 credits)**Choose one of the following:**

COM 231 Communication Fundamentals
COM 240 Interpersonal Communication

ADO 3: Demonstrate computational skills and mathematical reasoning (3-5 credits)**Take the following:**

MTH 120 Beginning Algebra or higher

ADO 4: Demonstrate scientific reasoning (4-5 credits)**Choose one of the following:**

BIO 110 Introductory Biology
BIO 131 General Biology
BIO 132 Human Biology
BIO 155 Human Anatomy & Physiology
BIO 220 Microbiology
BIO 253 Human Anatomy and Physiology I
CEM 131 Fundamentals of Chemistry
CEM 141 General Chemistry I
GEL 160 Introduction to Geology
NSC 131 Contemporary Science
PHY 131 Conceptual Physics
PHY 151 Astronomy
PHY 231 College Physics I
PHY 251 Modern University Physics I

ADO 5: Understand human behavior and social systems, the principles which govern them, and their implications for the present and future (3-4 credits)**Choose one of the following:**

ECN 231 Macroeconomics
ECN 232 Microeconomics
HIS 131 Western Civilization to 1555
HIS 132 Western Civilization 1555 to Present
HIS 231 Development of the US through the Civil War
HIS 232 Development of the US from the Civil War
HIS 235 20th Century History
PSY 140 Introduction to Psychology
SOC 231 Principles of Sociology

ADO 6: Understand aesthetic experience and artistic creativity (3 credits)**Choose one of the following:**

ART 111 Art History: Prehistoric to 1400
ART 112 Art History: Renaissance to Present
ENG 210 Introduction to Film
ENG 246 Short Story & Novel
ENG 247 Poetry & Drama
ENG 252 Shakespeare
ENG 254 Children's Literature
ENG 255 American Literature — 19th Century
ENG 256 American Literature — 20th Century
HUM 131 Cultural Connections
MUS 131 Understanding Music
THR 116 Introduction to Theatre

ADO 7: Think critically

Program courses meet this requirement

ADO 8: Make responsible decisions in personal and professional contexts (1-3 credits)**Choose one of the following:**

HPF 160 Wellness
HPF 277 Stress Management
HPF 283 Managing Stress and Holistic Health
PHL 236 Ethics

ADO 9: Work productively with others, recognizing individual contributions to group success

Program courses meet this requirement

ADO 10: Understand and respect the diversity and interdependence of the world's peoples and cultures

Program courses meet this requirement

MFG TECH/MAINTENANCE RELATED REQUIREMENTS — (3 credits)**Take the following:**

ELT 070 Basic Industrial Electricity
FYS 110 Life Maps

MFG TECH/MAINTENANCE CORE REQUIREMENTS — (35 credits)**Take the following:**

MFG 005 Technical Problem Solving
MFG 020 Robotics & Material Handling
MFG 025 Basic Computer Skills
MFG 060 Geometry for Manufacturing
MFG 065 Trigonometry for Manufacturing
MFG 105 Blueprint Reading
MFG 115 GD and T
MFG 160 Materials/Metallurgy
MFG 170 Hydraulics/Pneumatics
MFG 185 Maintenance & Troubleshooting
MFG 190 Drive Components & Bearings
MFG 200 Basic Gauges & Measurement
MFG 255 Basic PLC
MFG 260 Industrial Wiring

**MANUFACTURING TECH / TOOL ROOM
— ASSOCIATE IN APPLIED SCIENCE
(MATR.AAS)**

This Associate in Applied Science degree program is designed to provide the theoretical knowledge and the hands-on experience necessary to be successful in the increasingly technical area of manufacturing tool room operations. Many of the courses in this curriculum coincide with the Academy for Manufacturing Careers BAT certificate program making this an ideal continuation after completion of your journeyman's certificate.

Minimum credits:	62
Minimum cumulative GPA:	2.0
Minimum grade in all courses:	2.0
Minimum JCC credits:	12
MACRAO agreement:	No

GENERAL EDUCATION REQUIREMENTS – (23 credits)

ADO 1: Write clearly, concisely and intelligibly (6 credits)

Take the following:

- ENG 131 Writing Experience
- ENG 232 Technical & Business Writing

ADO 2: Speak clearly, concisely and intelligibly (3 credits)

Choose one of the following:

- COM 231 Communication Fundamentals
- COM 240 Interpersonal Communication

ADO 3: Demonstrate computational skills and mathematical reasoning (3-5 credits)

Take the following:

- MTH 120 Beginning Algebra or higher

ADO 4: Demonstrate scientific reasoning (4-5 credits)

Take the following:

- PHY 131 Conceptual Physics

ADO 5: Understand human behavior and social systems, the principles which govern them, and their implications for the present and future (3-4 credits)

Choose one of the following:

- ECN 231 Macroeconomics
- ECN 232 Microeconomics
- HIS 131 Western Civilization to 1555
- HIS 132 Western Civilization 1555 to Present
- HIS 231 Development of the US through the Civil War
- HIS 232 Development of the US from the Civil War
- HIS 235 20th Century History
- PSY 140 Introduction to Psychology
- SOC 231 Principles of Sociology

ADO 6: Understand aesthetic experience and artistic creativity (3 credits)

Choose one of the following:

- ART 111 Art History: Prehistoric to 1400
- ART 112 Art History: Renaissance to Present
- ENG 210 Introduction to Film
- ENG 246 Short Story & Novel
- ENG 247 Poetry & Drama
- ENG 252 Shakespeare
- ENG 255 American Literature – 19th Century
- ENG 256 American Literature – 20th Century
- HUM 131 Cultural Connections
- MUS 131 Understanding Music
- THR 116 Introduction to Theatre

ADO 7: Think critically

Program courses meet this requirement

ADO 8: Make responsible decisions in personal and professional contexts (1-3 credits)

Choose from the following:

- HPF 160 Wellness
- HPF 277 Stress Management

- HPF 283 Managing Stress and Holistic Health
- PHL 236 Ethics

ADO 9: Work productively with others, recognizing individual contributions to group success

Program courses meet this requirement

ADO 10: Understand and respect the diversity and interdependence of the world's peoples and cultures

Program courses meet this requirement

MANUFACTURING/TOOL ROOM RELATED REQUIREMENTS (7 credits)

Take the following:

- ECN 232 Microeconomics
- FYS 110 Life Maps
- PLS 141 American National Government

MANUFACTURING/TOOL ROOM CORE REQUIREMENTS (32 credits)

Take the following:

- MFG 005 Technical Problem Solving
- MFG 025 Basic Computer Skills
- MFG 060 Geometry for Manufacturing
- MFG 065 Trigonometry for Manufacturing
- MFG 105 Blueprint Reading
- MFG 115 GD and T
- MFG 120 Jig and Fixture Design
- MFG 125 Die Theory and Design
- MFG 150 Machining Theory & Methods
- MFG 160 Materials/Metallurgy
- MFG 175 CNC Theory & Programming
- MFG 180 EDM Theory
- MFG 200 Basic Gauges & Measurement

PROCESS TECHNOLOGY-CONCENTRATION (PRTE.CON)

A process technician is a key member of a team responsible for planning, analyzing and controlling production in a variety of process industries. The duties of a process technician including maintaining a safe work environment, controlling, monitoring and troubleshooting equipment, analyzing, evaluating and communicating about data concerning the process. The Process Technology Concentration will prepare the student for entry into the process industry by introducing the knowledge and skill sets necessary for each of the major process functions.

Minimum credits:	22
Minimum cumulative GPA:	2.0
Minimum grade in all courses:	2.0
Minimum JCC credits:	12
MACRAO agreement:	No

REQUIRED COURSES – (22 credits)

Take the following:

- PTC 100 PTEC I-Introduction to Process Technology
- PTC 110 PTEC II-Process Technology Equipment
- PTC 120 PTEC III-Process Technology Systems
- PTC 200 PTEC IV-Process Technology Operations

PTC 210 PTEC V-Safety, Health & Environment
 PTC 220 PTEC VI-Quality Systems
 PTC 230 PTEC VII-Instrumentation
 FYS 110 Life Maps

APPRENTICESHIP INFORMATION

Apprenticeship programs are available in many trades in cooperation with an employer or a joint apprenticeship committee representing labor and management. The U.S. Department of Labor/Bureau of Apprenticeship and Training registers and monitors the programs to ensure quality in apprenticeship programs nationwide.

Apprenticeship training involves classroom and on-the-job training over a span of usually four years. The process of applying knowledge on the job provides the apprentice with the opportunity to develop the necessary skills for a particular trade.

Upon completion of all employer-specified coursework and the required hours of on-the-job instruction, the employer may recommend that the apprentice receive a completion certificate from the U.S. Department of Labor/Bureau of Apprenticeship and Training.

For more information call Jackson Area Manufacturing Association (JAMA)
 517.782.8268

TRANSFER PROGRAMS – PRE-ARCHITECTURE

Architects design buildings and other structures. These buildings must be attractive as well as functional, safe and economical, and must suit the needs of the people who use them. Architects take all these things into consideration when they design buildings and other structures.

Architects provide a wide variety of professional services to individuals and organizations planning a construction project. They may be involved in all phases of development, from the initial discussion of general ideas with the client through the entire life of the facility. Their duties require a number of skills - design, engineering, managerial, communication and supervisory.

ENGINEERING

Engineers apply science, mathematics, and professional judgment to solve technical problems in industry and society. Today engineers are expected to contribute more than their technical competence. They are concerned with the impact of their work on society.