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# *Engineering/Manufacturing and Industrial Technology*

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*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.*

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## **Degrees/Certificates**

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- **Automotive Service Technology & Toyota Technical Education Network, Ford Maintenance and Light Repair**
- **Aviation Technology**
- **Climate Control Systems (HVAC)**
- **Customer Energy Specialist**
- **Drafting Technology**
- **Electronic Technology with General EET option or Microcomputer Support Option**
- **A+ Certification Program - Computer Service Technician**
- **Manufacturing Technology**
- **Mechanical Engineering Technician**
- **Manufacturing Technology with Machine Tool and Numerical Control Options**

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## **Related Trades**

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- **Die Designer**
- **Die Maker**
- **Electrician**
- **Industrial Maintenance Mechanic**
- **Institutional Maintenance Mechanic**
- **Machine Builder**
- **Machine Operator I**
- **Machine Repair**
- **Machine Tool Set-Up Operator**
- **Machinist**
- **Millwright**
- **Moldmaker**
- **Tool Designer**
- **Tool & Die Maker**
- **Tool Maker**

# Transfer Programs

The first two-years of a student's college education usually consist of general study courses, introductory courses in a major and/or program of study, and selected electives. Refer to Pages 37-39 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**

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## Automotive Service Technology, Toyota Technical Education Network, Ford Maintenance and Light Repair Associate in Applied Science

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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 the 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 of 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.

Our Toyota corporate sponsored connection is called T-Ten. As part of the Toyota Technical Education Network, 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. Toyota provides T-TEN students with: Toyota work uniforms, Toyota 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.

Our Ford corporate sponsored connection is called MLR. As part of the Ford Maintenance and Light Repair network, 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, and upon successful completion of the course and the Ford Multimedia Training exit exam 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 JCC credits: 12  
MACRAO agreement: No

Contact Program Staff, Les Coxon at 517-796-8541 or Dan Livingston at 517-796-8540.

### GENERAL EDUCATION REQUIREMENTS (17 credits)

#### ENGLISH (3 credits)

ENG 131 Writing Experience . . . . . 3

#### MATHEMATICS (3 credits)

Choose any one of the following:

MTH 110 Pre-Algebra . . . . . 3  
MTH 112 Business Math . . . . . 3  
MTH 120 Beginning Algebra . . . . . 4  
MTH 131 Intermediate Algebra . . . . . 4  
MTH 133 Introduction to Probability & Statistics . . . . . 3  
MTH 140 Pre-calculus . . . . . 5  
MTH 151 Calculus I . . . . . 4

#### SCIENCE (4 credits)

Choose one of the following:

BIO 131 General Biology . . . . . 4  
BIO 132 Human Biology . . . . . 4  
BIO 151 General Botany . . . . . 4  
BIO 152 General Zoology . . . . . 4  
BIO 155 Human Anatomy . . . . . 5  
CEM 121 Chemistry of Life . . . . . 4  
CEM 131 General Chemistry . . . . . 4  
CEM 132 Organic and Biological Chemistry . . . . . 4  
CEM 151 General Inorganic Chemistry . . . . . 4  
CEM 152 General Inorganic Chemistry with Analysis . . . . . 4  
GEL 160 Introduction to Geology . . . . . 4  
NSC 131 Contemporary Science . . . . . 4  
PHY 131 Our Physical World . . . . . 4  
PHY 151 Astronomy . . . . . 4  
PHY 231 College Physics I . . . . . 4  
PHY 251 Modern University Physics II . . . . . 5

#### SOCIAL SCIENCE (3 credits)

Choose one of the following:

ANT 131 Introduction to Anthropology . . . . . 3  
CRJ 101 Criminal Law . . . . . 3  
CRJ 104 Criminal Justice Psychology . . . . . 3  
CRJ 111 Introduction to Criminal Justice . . . . . 3

CRJ 120	Human Relations for Corrections	3
CRJ 127	Corrections Law	3
ECN 231	Macroeconomics	3
ECN 232	Microeconomics	3
GEO 131	Physical Geography	3
HIS 120	Ancient History	3
HIS 131	Western Civilization to 1555	4
HIS 132	Western Civilization 1955 to Present	4
HIS 231	Development of the US through the Civil War	3
HIS 232	Development of the US from the Civil War	3
PLS 141	American National Government	3
PSY 140	Introduction to Psychology	4
PSY 152	Social Psychology	3
PSY 251	Abnormal Psychology	3
PSY 252	Developmental Psychology	3
SOC 152	Social Psychology	3
SOC 231	Principles of Sociology	3
SOC 236*	Women in a Changing Society	3

**HUMANITIES (3 credits)**

Choose one of the following:

ART 111	Art History: Prehistoric - 1400	3
ART 112	Art History: Renaissance - Present	3
ENG 210	Introduction to Film	3
ENG 236*	Women in a Changing Society	3
ENG 246	Short Story & Novel	3
ENG 247	Poetry and Drama	3
ENG 249	African-American Literature	3
ENG 254	Children's Literature	3
ENG 255	American Literature 19th Century	3
ENG 256	American Literature 20th Century	3
ENG 257	World Literature I	3
HUM 131	Cultural Connections	3
MUS 130	Survey of Non-Western Music	3
MUS 131	Understanding Music	3
MUS 133	Music Education	3
MUS 151	Music Theory I	4
MUS 152	Music Theory II	4
PHL 231	Intro to Philosophy	3
PHL 232	Logic	3
THR 116	Introduction to Theatre	3

\*Cannot be double-counted; prefix chosen at registration cannot be changed.

**HEALTH/PHYSICAL FITNESS (1 credit)**

Choose one of the following:

HPF 160	Wellness	1
HPF 168	Weight Training & Conditioning	2
HPF 221	Jazz Techniques	3
HPF 268	Advanced Weight Training	2
HPF 277	Stress Management	2
HPF 278	Stress Management for Parents	2

**AUTOMOTIVE SERVICE TECHNOLOGY**

**REQUIREMENTS (38 credits)**

AUT 102	Engine Performance I	4
AUT 103	Engine Performance II	4
AUT 105	Automotive Brakes	3
AUT 106	Suspension and Steering	3
AUT 108	Automotive Air Conditioning/Heating	3
AUT 112	Electrical Systems I	3
AUT 113	Electrical Systems II	3
AUT 201	Engine Repair	4
AUT 202	Automatic Transmission	4

AUT 204	Manual Drivetrain	3
AUT 210	Co-op Experience	4

**AUTOMOTIVE SERVICE TECHNOLOGY ELECTIVES**

(8 credits)

AUT 101	General Service	2
AUT 211	Co-Op Experience	4
AUT 212	Co-Op Experience	4
AUT 242	General Automotive Lab	2

or select electives from classes in BUS, EET, MTT or WLD

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## Automotive Service Technology, Toyota Technical Education Network, Ford Maintenance and Light Repair Certificate

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This program provides classroom and laboratory experiences that prepare the student for entry-level employment in the automotive service field. It also prepares students for the Michigan and/or Automotive Service Excellence (ASE) certification tests.

To earn the Brakes and Front End certificate, Driveability certificate or Powertrain certificate the student must complete the courses shown and maintain a minimum 2.0 grade point average. Students need to complete all three certificates to receive a JCC certificate in Automotive Service Technology.

Minimum credits: 38  
 Minimum cumulative GPA: 2.0  
 Minimum JCC credits: 12  
 MACRAO agreement: No

Contact Program Staff Les Coxon at 517-796-8541 or Dan Livingston at 517-796-8540

**BRAKES AND FRONT END CERTIFICATE (6 credits)**

AUT 105	Automotive Brakes	3
AUT 106	Suspension and Steering	3

**DRIVEABILITY CERTIFICATE (17 credits)**

AUT 102	Engine Performance I	4
AUT 103	Engine Performance II	4
AUT 108	Automotive Air Conditioning/Heating	3
AUT 112	Electrical Systems I	3
AUT 113	Electrical Systems II	3
*AUT 211	Co-op	4

**POWERTRAIN CERTIFICATE (11 credits)**

AUT 201	Engine Repair	4
AUT 202	Automatic Transmission	4
AUT 204	Manual Drivetrain	3

**ADDITIONAL REQUIREMENT (4 credits)**

AUT 210	Co-op	4
AUT 211	Co-op	4
AUT 212	Co-op	4

# Aviation Flight Technology Associate in Applied Science

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.\*

Minimum credits: 60  
Minimum cumulative GPA: 2.0  
Minimum JCC credits: 12  
MACRAO agreement: No

## GENERAL EDUCATION REQUIREMENTS (17 credits)

### ENGLISH (3 credits)

ENG 131 Writing Experience ..... 3

### MATHEMATICS (3 credits)

Choose one of the following:

MTH 131 Intermediate Algebra ..... 4  
MTH 133 Intro to Probability and Statistics ..... 3

### SCIENCE (4 credits)

Choose one of the following:

PHY 131 Our Physical World ..... 4  
PHY 231 College Physics ..... 4

### SOCIAL SCIENCE (3 credits)

PLS 141 American National Government ..... 3

### HUMANITIES (3 credits)

HUM 131 Cultural Connections ..... 3

### HEALTH/PHYSICAL FITNESS (1 credit)

Choose one of the following:

HPF 160 Wellness ..... 1  
HPF 168 Weight Training & Conditioning ..... 2  
HPF 221 Jazz Techniques ..... 3  
HPF 277 Stress Management ..... 2  
HPF 278 Stress Management for Parents ..... 2

## AVIATION TECHNOLOGY REQUIREMENTS (35 credits)

AFT 100 Basic Maneuvers ..... 2  
AFT 110 Primary Ground School ..... 3  
AFT 115 Primary Flight I ..... 4  
AFT 120 Primary Flight II ..... 4  
AFT 125 Commercial Ground School ..... 3  
AFT 130 Commercial Flight I ..... 4  
AFT 135 Instrument Ground School ..... 3  
AFT 140 Commercial Flight II ..... 4  
AFT 200 Commercial Flight III ..... 4  
AFT 205 Commercial Flight IV ..... 4

## AVIATION TECHNOLOGY ELECTIVES

Select electives from all classes (except course letters CED, CEU, CFO, CJT, TEN) so that degree equals 60 credits.

### ADDITIONAL REQUIREMENT (4 credits)

Complete the current FAA requirements to meet the minimum flight time hours (see Flight Director and/or FAA for current requirements).

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

# Climate Control Technology Associate in Applied Science

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 JCC credits: 12  
MACRAO agreement: No

## GENERAL EDUCATION REQUIREMENTS (17 credits)

### ENGLISH (3 credits)

ENG 131 Writing Experience ..... 3

### MATHEMATICS (3-4 credits)

MTH 120 Beginning Algebra ..... 3-4  
or higher level mathematics course

### SCIENCE (4 credits)

Choose one of the following:

BIO 131 General Biology ..... 4  
CEM 121 Chemistry of Life ..... 4  
CEM 131 General Chemistry ..... 4  
CEM 151 General Inorganic Chemistry ..... 4  
GEL 160 Introduction to Geology ..... 4  
NSC 131 Contemporary Science ..... 4  
PHY 131 Our Physical World ..... 4  
PHY 151 Astronomy ..... 4

### SOCIAL SCIENCE (3 credits)

Choose one of the following:

PLS 141 American National Government ..... 3  
ECN 231 Macroeconomics ..... 3

### HUMANITIES (3 credits)

Choose one of the following:

PHL 231 Introduction to Philosophy ..... 3  
PHL 232 Logic ..... 3

### HEALTH/PHYSICAL FITNESS (1 credit)

Choose one of the following:

HPF 160 Wellness ..... 1  
HPF 168 Weight Training & Conditioning ..... 2  
HPF 221 Jazz Techniques ..... 3  
HPF 277 Stress Management ..... 2  
HPF 278 Stress Management for Parents ..... 2

## CLIMATE CONTROL REQUIREMENTS (29 credits)

AIT 065 Sheet Metal ..... 3  
AIT 121 Introduction to HVAC ..... 3  
AIT 123 Application of HVAC Technology ..... 3  
AIT 131 Basic HVAC Electricity/Controls ..... 2  
AIT 135 Refrigeration/Air Conditioning I ..... 3  
AIT 136 Refrigeration/Air Conditioning II ..... 3  
AIT 137 Advanced HVAC Electricity/Controls ..... 2  
AIT 141 Basic Heating ..... 2  
AIT 142 Advanced Heating ..... 2  
AIT 200 Mechanical Code ..... 2  
AIT 201 Refrigeration Certification ..... 1  
WLD 101 Welding ..... 3

## RELATED REQUIREMENTS (6 credits)

Choose two of the following:

BUS 155	Human Relations in Business	.3
ENG 232	Technical & Business Writing	.3
ITE 101	Information Technology Education	.3

## ADDITIONAL REQUIREMENTS

EMS 110	CPR & First Aid	.2
	or current Adult CPR & First Aid Certification	

## ELECTIVES

Select electives from classes in any courses (except those with prefixes CED, CEU, CFO) so that degree equals 60 credits.

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# Climate Control Systems Certificate

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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: 35  
Minimum cumulative GPA: 2.0  
Minimum JCC credits: 12  
MACRAO agreement: No

## CLIMATE CONTROL SYSTEMS REQUIREMENTS (36 credits)

AIT 065	Sheet Metal	.3
AIT 121	Introduction to HVAC	.3
AIT 123	Application of HVAC Technology	.3
AIT 131	Basic HVAC Electricity/Controls	.2
AIT 135	Refrigeration/Air Conditioning I	.3
AIT 136	Refrigeration/Air Conditioning II	.3
AIT 137	Advanced HVAC Electricity/Controls	.2
AIT 141	Basic Heating	.2
AIT 142	Advanced Heating	.2
AIT 200	Mechanical Code	.2
AIT 201	Refrigeration Certification	.1
ENG 232	Technical & Business Writing	.3
MTH 110	Basic Math	.3
	or higher level math course	
WLD 101	Welding	.3

## ADDITIONAL REQUIREMENTS

EMS 110	CPR & First Aid	.2
	or current Adult CPR & First Aid Certification	

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# Customer Energy Specialist Certificate

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Minimum credits: 44  
Minimum cumulative GPA: 2.0  
Minimum JCC credits: 12  
MACRAO agreement: No

## GENERAL EDUCATION REQUIREMENTS (9 credits)

ENG 131	Writing Experience	.3
ENG 232	Technical & Business Writing	.3
SPH 231	Communication Fundamentals	.3

## BUSINESS REQUIREMENTS (16 credits)

ACC 211	General Accounting	.4
or ACC 231	Principles of Accounting I	.4
BUS 101	Marketing	.3
BUS 131	Introduction to Business	.3
BUS 135	Business Law I	.3
ITE 101	Information Technology Education...	.3

## TECHNICAL REQUIREMENTS (19 credits)

CAD 121	Technical Drafting I	.4
CAD 131	Computer Assisted Drafting I(AutoCAD)	.3
or 140	Computer Assisted Drafting I(MicroStation)	.3
CAD 132	Computer Assisted Drafting II (AutoCAD)	.3
or 141	Computer Assisted Drafting II(MicroStation)	.3
RTI 147	Basic Electrical Math.....	.2
RTI 153	Fundamentals of Direct Current	.2
RTI 154	Fundamentals of Alternating Current	.3
RTI 260	Industrial Physics	.2

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# Manufacturing Technology Program

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In this fast-paced technological world, manufacturers are relying heavily on computer-aided design and production to ensure quality, increase productivity and keep a competitive edge. To accomplish their goals, manufacturers need workers with the skills to program computers to produce products, analyze production methods statistically, read blueprints for machined parts, maintain electronic instruments and use computers to design machine tools, just to name a few.

Manufacturing Technology prepares students for jobs as draftsmen, welders, numerical control machinists, digital computer maintenance workers, machine tool technicians, electronics technicians, electronics repair specialists and many other jobs associated with manufacturing.

Programs include Apprenticeship and Related Trades, Machine Tool Technology, Numerical Control Technology, Drafting, Electronics Technology, Quality Control Technology and Welding.

## Open Entry/Open Exit Delivery System

Many of the Manufacturing Technology courses are offered in a flexible, self-paced format referred to as Open Entry/Open Exit or OEOE. The delivery process of most courses previously offered in Manufacturing Technologies has been modified; however, the content of the courses retains its academic integrity. A course that is offered in the OE/OE format has been divided into smaller, very focused segments. These segments typically deal with only one topic and are referred to as a module. A module is considered a distinct course. Since each

module is a college course, it carries college credit and the student receives a grade for each module in which they have enrolled. If a student completes all the modules for a previously existing course, they will equal the requirements for that course.

Students enroll in modules at any time during the semester and begin studies as soon as enrollment is complete (usually the same day). All module work for the current semester needs to be completed by the end of that semester. Therefore, if a student enrolls near the beginning of the semester, then he/she would enroll in a series of modules. If they enroll near the end of the semester, then they would enroll for only one or two modules.

If a student has completed the modules for which they have enrolled before the end of the semester, they may enroll for additional modules. Grades for modules not completed by the end of the semester are assigned by the faculty responsible for that module based on the individual situation. The student should, however, make every effort to complete all modules in which they have enrolled by the end of the current semester.

Generally, students study and complete the theory portion of the module in the Technology and Learning Center and then complete the laboratory assignments in one of the Manufacturing Technology labs. The Technology and Learning Center is open days and evenings throughout the week. Specified Manufacturing Technology laboratories are open according to demand, offering hours in both day and evening.

A typical module consists of a title page, goals, performance objectives, learning activities, and checkout activities. The process for completion of a module begins with a review of the goals and objectives. Next the student scans the module and determines how much of the material they already know. Completing the necessary learning activities, that may include both theoretical and laboratory experiences, will prepare them for the final phase, which is the checkout activity or evaluation. Laboratory activities take place in one of the Manufacturing Technology labs under the guidance of an instructor. However, while working on any activity during the module, students are encouraged to work with an instructor if desired.

A list of modules and instructor schedules for each of the Manufacturing Technology areas can be obtained by contacting the Technology and Learning Center on JCC's main campus in JW 176.

Students in these programs are allowed a large measure of flexibility in choosing courses and scheduling their training. Those interested in gaining specific skills--students sponsored by their employers, for example--may work with a faculty advisor or the coordinator of the Technology and Learning Center to design an individualized course of study. Classroom and study schedules also are flexible, so students may complete work at times that won't interfere with jobs and manufacturing schedules. Training modules are selected from a "menu." When one module is completed, the student may go on to the next instruction module. It is not necessary to wait for the start

of a traditional college semester to begin the next phase of training.

For more information, call the Technology and Learning Center (TLC) in Justin Whiting Hall, Main Campus (517) 796-8435.

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## Drafting Technology Associate in Applied Science

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Prepares students for employment in the technical drafting field in the areas of detailing, layout, jig and fixture, die design or machine design in a computer-assisted drafting format.

Minimum credits: 61  
 Minimum cumulative GPA: 2.0  
 Minimum JCC credits: 12  
 MACRAO Agreement: No

### GENERAL EDUCATION REQUIREMENTS (18 credits)

**ENGLISH** (3 credits)  
 ENG 131 Writing Experience ..... 3

**MATHEMATICS** (4 credits)  
 MTH 131 Intermediate Algebra ..... 4

**SCIENCE** (4 credits)  
 PHY 231 College Physics I ..... 4

**SOCIAL SCIENCE** (3 credits)  
 Choose one of the following:  
 PLS 141 American National Government ..... 3  
 ECN 231 Macroeconomics ..... 3

**HUMANITIES** (3 credits)  
 Choose one of the following:  
 PHL 231 Intro to Philosophy ..... 3  
 PHL 232 Logic ..... 3

**HEALTH/PHYSICAL FITNESS** (1 credit)  
 Choose one of the following:  
 HPF 160 Wellness ..... 1  
 HPF 168 Weight Training & Conditioning ..... 2  
 HPF 221 Jazz Techniques ..... 3  
 HPF 277 Stress Management ..... 2  
 HPF 278 Stress Management for Parents ..... 2

**RELATED REQUIREMENTS (18 credits)**  
 ITE 101 Information Technology Education ..... 3  
 ENG 232 Business & Technical Writing ..... 3  
 MTH 132 Plane Trigonometry ..... 2  
 MTT 105 Machine Tool Technology I ..... 4  
 MTT 133 Metallurgy ..... 3  
 QCT 115 Basic Coordinate Measuring Machine ..... 1  
 QCT 141 Statistical Process Control ..... 1  
 QCT 142 Control Chart Interpretation ..... 1

**DRAFTING TECHNOLOGY REQUIREMENTS (25 credits)**  
 CAD 121 Technical Drafting I ..... 4  
 CAD 122 Technical Drafting II ..... 4  
 CAD 131 Computer Assisted Drafting I – AutoCAD ..... 3  
 CAD 132 Computer Assisted Drafting II – AutoCAD II ..... 3

CAD 133	Computer Assisted Drafting III – AutoCAD III 3-D	3
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**CHOOSE OPTION 1 OR OPTION 2:**

**OPTION 1**

CAD 241	Mechanical Design I (Jig & Fixture)	4
or CAD 261	Mech. Detailing I (Detail Fixtures)	4
CAD 243	Mechanical Design II (Dies)	4
or CAD 262	Mechanical Detailing II (Detail Dies)	4

**OPTION 2**

CAD 241	Mechanical Design I (Jig & Fixture)	4
or CAD 261	Mech. Detailing I (Detail Fixtures)	4
CAD 248	Mechanical Design III (Machine)	4
or CAD 263	Mechanical Detailing III (Machine)	4

## Drafting Technology Certificate

Minimum credits: 32  
 Minimum cumulative GPA: 2.0  
 Minimum JCC credits: 12  
 MACRAO agreement: No

**REQUIRED COURSES (7 credits)**

ITE 083	Windows Workshop	1
MTT 105	Machine Tool Technology I	4
RTI 147	Basic Electrical Math	2

**DRAFTING TECHNOLOGY REQUIREMENTS (17 credits)**

CAD 121	Technical Drafting	4
CAD 131	Computer Assisted Drafting I (AutoCAD)	3
CAD 122	Technical Drafting II	4
CAD 132	Computer Assisted Drafting II (AutoCAD)	3
CAD 133	Computer Assisted Drafting III (AutoCAD)	3

**STUDENTS MUST CHOOSE OPTION 1 OR OPTION 2  
(8 Credits)**

**Option 1**

CAD 261	Mechanical Detailing I (Detail Fixtures)	4
CAD 262	Mechanical Detailing II (Detail Dies)	4

**Option 2**

CAD 261	Mechanical Detailing I (Detail Fixtures)	4
CAD 263	Mechanical Detailing III (Machine)	4

# Electronic Technology With General EET Option & Microcomputer Support Option Associate in Applied Science

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 technologist, which is recognized by Comp TIA. The non-profit Computing Technology Industry Association (Comp TIA) is widely recognized as the standard for qualified computer service professionals.

Minimum credits: 68  
 Minimum cumulative GPA: 2.0  
 Minimum JCC credits: 12  
 MACRAO agreement: No

**GENERAL EDUCATION REQUIREMENTS (19 credits)**

**GENERAL EET - EITHER OPTION**

**ENGLISH (3 credits)**

ENG 131	Writing Experience	3
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**MATHEMATICS (5 credits)**

MTH 140	Pre-calculus	5
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**SCIENCE (4 credits)**

PHY 231	College Physics I	4
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**SOCIAL SCIENCE (3 credits)**

Choose one of the following:

PLS 141	American National Government	3
ECN 231	Macroeconomics	3

**HUMANITIES (3 credits)**

Choose one of the following:

PHL 231	Introduction to Philosophy	3
PHL 232	Logic	3

**HEALTH/PHYSICAL FITNESS (1 credit)**

Choose one of the following:

HPF 160	Wellness	1
HPF 168	Weight Training & Conditioning	2
HPF 221	Jazz Techniques	3
HPF 277	Stress Management	2
HPF 278	Stress Management for Parents	2

**RELATED REQUIREMENTS (11 credits)**

Choose one of the following groups:

**TRANSFER GROUP (General EET option)**

ITE 182	Programming in C++	3
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# Electronic Technology with General EET Option & Microcomputer Support Option Certificate

Minimum credits: 37  
Minimum cumulative GPA: 2.0  
Minimum JCC credits: 12  
MACRAO agreement: No

## ELECTRONIC TECHNICIAN REQUIREMENTS

Take 1 of the following groups:

### GROUP 1: GENERAL EET MAJOR (29 credits)

ITE 101	Information Technology Education	3
EET 110	PC Theory and Servicing	2
EET 120	Circuit Analysis I	4
EET 125	Circuit Analysis II	3
EET 130	Electronics I	4
EET 140(all)*	Introduction to Digital Electronics	4
MTH 131	Intermediate Algebra	4
ENG 131	Writing Experience	3
EET 210	Adv PC Theory & Servicing	2

### GROUP 2: MICROCOMPUTER SUPPORT OPTION

(30 credits)

EET 110	PC Theory and Servicing	2
EET 120	Circuit Analysis I	4
	or EET Modules 20AD, 20AH, 20AL, 20AP, 20AT, 20AX, 20BL, 20BP, 20BX, 20CA	
EET 125	Circuit Analysis II	3
	or EET Modules 25AD, 25AH, 25AL, 25AP, 25AT, 25BA, 25BD, 25BH	
EET 130	Electronics I	4
	or EET Modules 30AD, 30AH, 30AT, 30AX, 30BA, 30BP	
EET 140	Introduction to Digital Electronics	4
	or EET Modules 40AD, 40AL, 40AP, 40AX, 40BA, 40BD, 40BL, 40BT	
ITE 047	Operating Systems: UNIX	1
ITE 083	Windows Workshop	1
ITE 067	MS DOS Workshop	1
ITE 101	Information Technology Education	3
ITE 221	Network Administration	3
MTH 131	Intermediate Algebra	4
ENG 131	Writing Experience	3
EET 210	Adv PC Theory and Service	2

## RELATED REQUIREMENTS

(6 credits for General EET major or  
3 credits for Microcomputer Support Option)

ITE 101	Information Technology Education	3
RTI 346 (all)*	Electric Motors and Controls	4
RTI 157 (all)*	Introduction to PLCS	4
EET 280 (all)*	Digital Systems	4
ITE 134	Visual Basic 2 for Windows	3

or ITE 134	Computer Programming - Visual Basic	3
or ITE 117	Computer Programming: BASIC	3
MTH 151	Calculus I	4
PHY 232	College Physics II	4

### NON-TRANSFER GROUP (General EET option)

ITE 182	Programming in C++	3
or ITE 134	Computer Programming - Visual Basic	3
or ITE 117	Computer Programming - Basic	3

AND

Choose 8 credits from the following: any CAD, EET, ITE, MTT, NCT, QCT, RTI, WLD course that best meet your educational goals

### MICROCOMPUTER SUPPORT GROUP

ITE 182	Programming in C++	3
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AND

Choose 8 credits from the following: any CAD, EET, ITE, MTT, NCT, QCT, RTI, WLD course that best meet your educational goals

## TECHNICAL MAJOR REQUIREMENTS

Choose 1 of the following groups

### GROUP 1: GENERAL EET MAJOR (38 credits)

ITE 101	Information Technology Education	3
EET 110	PC Theory and Servicing	2
EET 120	Circuit Analysis I	4
EET 125	Circuit Analysis II	3
EET 130	Electronics I	4
EET 140 (all)*	Introduction to Digital Electronics	4
RTI 346 (all)*	Motors and Controls	4
RTI 157 (all)*	Programmable Logic Controllers	4
EET 210	Adv PC Theory & Servicing	2
EET 270	Communications Circuits	4
EET 280	Digital Systems	4

### GROUP 2: MICROCOMPUTER SUPPORT OPTION (38 credits)

EET 110	PC Theory and Servicing	2
EET 120	Circuit Analysis I	4
	or EET Modules 20AD, 20AH, 20AL, 20AP, 20AT, 20AX, 20BL, 20BP, 20BX, 20CA	
EET 125	Circuit Analysis II	3
	or EET Modules 25AD, 25AH, 25AL, 25AP, 25AT, 25BA, 25BD, 25BH	
EET 130	Electronics I	4
	or EET Modules 30AD, 30AH, 30AT, 30AX, 30BA, 30BP	
EET 140	Introduction to Digital Electronics	4
	or EET Modules 40AD, 40AL, 40AP, 40AX, 40BA, 40BD, 40BL, 40BT	
EET 280 (all) *Digital Systems		4

ITE 047	Operating Systems: UNIX	1
ITE 083	Windows Workshop	1
ITE 067	MS DOS Workshop	1
ITE 101	Information Technology Education	3
ITE 220	Networking Technologies	3
ITE 221	Network Administration	3
ITE 134	Visual Basic 2 for Windows	3
BUS 155	Human Relations in Business	3
EET 210	Adv. P C Theory & Service	2

and electives to meet 68 credit degree requirement

\*Courses offered in module format

## TECHNICAL ELECTIVES

Select classes from CAD, EET, ITE, NCT, MTT, QCT, RTI, WLD to meet your 37 credit certificate requirement

*\*Course offered in module format*

# A+ Certification Program Computer Service Technician

The A+ Certification program is designed to prepare students to work as a computer service professional. A+ Certification is the recognized industry standard for computer service technicians. This certification is the "journeyman's card" for professionals in microcomputer maintenance. Comp TIA (Computing Technology Industry Association) is the certifying agent, a non-profit industry group which determines competencies. Comp TIA assures the quality of those who successfully pass the A+ Certification test. Jackson Community College provides this program to prepare students to pass the A+ test. The test is administered by Comp TIA's agent.

Minimum credits: 12.48  
Minimum cumulative GPA: 2.0  
Minimum JCC credits: 12  
MACRAO agreement: No

EET 20AD	Electricity . . . . .	0.18
EET 20AH	Current Flow and Circuits . . . . .	0.23
EET 20AL	Electromotive Force . . . . .	0.41
EET 20AP	Voltage Drops . . . . .	0.19
EET 20AT	Resistance . . . . .	0.47
EET 110	A+ PC Theory & Servicing . . . . .	2
EET 113	A+ Windows Computer Networking . . . . .	2
EET 210	A+ Advanced PC Theory & Servicing . . . . .	2
ITE 083	Windows Workshop . . . . .	1
ITE 067	MS DOS Workshop . . . . .	1
ITE 101	Information Technology Education . . . . .	3
	Total . . . . .	12.48

### Suggested Course Sequence

#### Fall Semester (5.48 credits)

EET 110, the EET modules, ITE 083, ITE 067

#### Winter Semester (7 credits)

EET 113, EET 210, ITE 101

# Manufacturing Technology Associate in Applied Science

Designed to provide the knowledge and experience necessary to understand, apply and control engineering procedures in manufacturing processes.

Minimum credits: 62  
Minimum cumulative GPA: 2.0  
Minimum JCC credits: 12  
MACRAO agreement: No

## GENERAL EDUCATION REQUIREMENTS (18 credits)

### ENGLISH (3 credits)

ENG 131 Writing Experience . . . . . 3

### MATHEMATICS (4 credits)

Choose one of the following:

MTH 140 Pre-calculus . . . . . 5  
MTH 151 Calculus I . . . . . 4

### SCIENCE (4 credits)

PHY 231 College Physics I . . . . . 4

### SOCIAL SCIENCE (3 credits)

Choose one of the following:

PLS 141 American National Government . . . . . 3  
ECN 231 Macroeconomics . . . . . 3

### HUMANITIES (3 credits)

Choose one of the following:

PHL 231 Introduction to Philosophy . . . . . 3  
PHL 232 Logic . . . . . 3

### HEALTH/PHYSICAL FITNESS (1 credit)

Choose one of the following:

HPF 160 Wellness . . . . . 1  
HPF 168 Weight Training & Conditioning . . . . . 2  
HPF 221 Jazz Techniques . . . . . 3  
HPF 277 Stress Management . . . . . 2  
HPF 278 Stress Management for Parents . . . . . 2

## RELATED REQUIREMENTS (10 credits)

ENG 132 Writing Experience . . . . . 3  
or ENG 232 Technical & Business Writing . . . . . 3  
PHY 232 College Physics II . . . . . 4  
CPS 175 Computer Programming I: FORTRAN . . . . . 3  
or ITE 117 Computer Programming - BASIC . . . . . 3

## MANUFACTURING ENGINEERING TECHNOLOGY REQUIREMENTS (23 credits)

CAD 121 Technical Drafting I . . . . . 4  
CAD 122 Technical Drafting II . . . . . 4  
MTT 105 Machine Tool Technology I . . . . . 4  
MTT 106 Machine Tool Technology II . . . . . 4  
MTT 133 Metallurgy . . . . . 3  
EET 120 Circuit Analysis I . . . . . 4

## MANUFACTURING ENGINEERING TECHNOLOGY

### OPTIONS (11 credits)

Choose 1 of the following groups:

#### CAD/CAM GROUP

NCT 121	Introduction to Numerical Control . . . . .	2
CAD 131	Computer Assisted Drafting I (AutoCAD) . . .	3
or 140	Computer Assisted Drafting I(MicroStation) .	3
CAD 132	Computer Assisted Drafting II (AutoCAD) . .	3
or 141	Computer Assisted Drafting II(MicroStation) .	3
NCT 123	N/C Machine Tool Operations . . . . .	3

#### QUALITY CONTROL GROUP

QCT 111	Using Precision Measuring Instruments I . . .	1
QCT 113	Using Precision Measuring Instruments II . . .	1
QCT 115	Basic CMM Techniques . . . . .	1
QCT 141	Statistical Process Control: X-bar and R charts1 . . . . .	1
QCT 143	Statistical Process Control: Attribute Charts .	1

#### ELECTIVES

Select classes from QCT, NCT or MTT to meet 62 credit degree requirement

## Mechanical Engineering Technician Certificate

Prepares students to act as a liaison between engineering staff and journeymen. Coursework in design areas gives the student the ability to understand and interpret engineering language and concepts. Coursework in the manufacturing areas gives the student the ability to understand and apply those concepts in the manufacturing arena. This certificate would be of assistance to current journeymen who desire to become a part of the management team.

Minimum Credits: 45  
Minimum Cumulative GPA: 2.0  
Minimum JCC Credits: 12  
MACRAO agreement: No

#### REQUIRED COURSES

RTI 012	Math II - Algebra . . . . .	2
RTI 013	Math III - Geometry . . . . .	2
RTI 014	Math IV - Trigonometry . . . . .	2
RTI 020	Blue Print Reading I . . . . .	2
RTI 021	Blue Print Reading II (GD&T) . . . . .	2
RTI 050	Machine Theory I . . . . .	2
RTI 051	Machining Theory . . . . .	2
RTI 054	Machining Methods . . . . .	4
RTI 070	Basic Industrial Electricity . . . . .	2
RTI 163	Hydraulic/Pneumatic . . . . .	2
CAD 121	Technical Drafting I . . . . .	4
CAD 122	Technical Drafting II . . . . .	4
CAD 131	Computer Assisted Drafting I (AutoCAD) . . .	3
CAD 241	Mechanical Design I (Jig & Fixture) . . . . .	4
CAD 243	Mechanical Design II (Die) . . . . .	4
CAD 248	Mechanical Design III (Machine) . . . . .	4

## Manufacturing Technology with Machine Tool Option Associate in Applied Science

Designed for students who plan to enter an occupation upon graduation. Manufacturing Technology students learn to solve problems by applying a variety of technical skills. The student may elect to concentrate on numerical control or machine tool technology. A certificate is granted in the area of choice.

Minimum credits: 62  
Minimum cumulative GPA: 2.0  
Minimum JCC credits: 12  
MACRAO agreement: No

#### GENERAL EDUCATION REQUIREMENTS (17 credits)

##### ENGLISH (3 credits)

ENG 131	Writing Experience . . . . .	3
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##### MATHEMATICS (3 credits)

MTH 131	Intermediate Algebra or higher level mathematics course . . . . .	3
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##### SCIENCE (4 credits)

PHY 231	College Physics I . . . . .	4
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##### SOCIAL SCIENCE (3 credits)

Choose one of the following:

PLS 141	American National Government . . . . .	3
ECN 231	Macroeconomics . . . . .	3

##### HUMANITIES (3 credits)

Choose one of the following:

PHL 231	Introduction to Philosophy . . . . .	3
PHL 232	Logic . . . . .	3

##### HEALTH/PHYSICAL FITNESS (1 credit)

Choose one of the following:

HPF 160	Wellness . . . . .	1
HPF 168	Weight Training & Conditioning . . . . .	2
HPF 221	Jazz Techniques . . . . .	3
HPF 277	Stress Management . . . . .	2
HPF 278	Stress Management for Parents . . . . .	2

#### RELATED REQUIREMENTS (10 credits)

ENG 132	Writing Experience . . . . .	3
or ENG 232	Technical & Business Writing . . . . .	3
ITE 083	Windows Workshop . . . . .	1
or ITE 049	Windows NT Workshop . . . . .	1
MTH 132	Plane Trigonometry . . . . .	2
MTT 143	Fundamentals of Drafting . . . . .	2
MTT 118	Industrial Print Reading/Geometric Dimensioning and Tolerancing . . . . .	2

#### MACHINE TOOL TECHNOLOGY (31 credits)

MTH 120	Beginning Algebra . . . . .	4
MTT 105	Machine Tool Technology I . . . . .	4
MTT 106	Machine Tool Technology II . . . . .	4
MTT 110	Production Machining . . . . .	4
MTT 112	Tool Room Machining . . . . .	4
MTT 133	Metallurgy . . . . .	3

NCT 121	Introduction to Numerical Control	2
NCT 123	Numerical Control Machine Tool Operations	.3
WLD 101	Basic Welding	.3

### TECHNICAL ELECTIVES

Select classes from CAD, EET, ITE, NCT, MTT, QCT, RTI, or WLD to meet your 62 credit degree requirement.

## Machine Tool Technology Certificate

Machine Tool Technology certificate helps prepare students for entry-level employment in many trade areas where the use of machinist's hand tools and the operation of machine tools is of prime importance.

Minimum credits: 31  
 Minimum cumulative GPA: 2.0  
 Minimum JCC credits: 12  
 MACRAO agreement: No

### MACHINE TOOL TECHNOLOGY (31 credits)

MTH 120	Beginning Algebra	4
MTT 105	Machine Tool Technology I	4
MTT 106	Machine Tool Technology II	4
MTT 110	Production Machining	4
MTT 112	Tool Room Machining	4
MTT 133	Metallurgy	3
NCT 121	Introduction to Numerical Control	2
NCT 123	Numerical Control Machine Tool Operations	.3
WLD 101	Basic Welding	.3

## Manufacturing Technology with Numerical Control Option Associate in Applied Science

Manufacturing Technology is designed for students who plan to enter an occupation upon graduation. Manufacturing Technology students learn to solve problems by applying a variety of technical skills. The student may elect to concentrate on numerical control, machine tool, or quality control technology. A certificate is granted in the area of choice.

Minimum credits: 60  
 Minimum cumulative GPA: 2.0  
 Minimum JCC credits: 12  
 MACRAO agreement: No

### GENERAL EDUCATION REQUIREMENTS (18 credits)

<b>ENGLISH</b> (3 credits)		
ENG 131	Writing Experience	3
<b>MATHEMATICS</b> (4 credits)		
MTH 131	Intermediate Algebra	4
<b>SCIENCE</b> (4 credits)		

PHY 231	College Physics I	4
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### SOCIAL SCIENCE (3 credits)

Choose one of the following:

PLS 141	American National Government	3
ECN 231	Macroeconomics	3

### HUMANITIES (3 credits)

Choose one of the following:

PHL 231	Intro to Philosophy	3
PHL 232	Logic	3

### HEALTH/PHYSICAL FITNESS (1 credit)

Choose one of the following:

HPF 160	Wellness	1
HPF 168	Weight Training and Conditioning	2
HPF 221	Jazz Techniques	3
HPF 277	Stress Management	2
HPF 278	Stress Management for Parents	2

### RELATED REQUIREMENTS (16 credits)

ITE 101	Information Technology Education	3
ENG 232	Business & Technical Writing	3
MTH 132	Plane Trigonometry	2
MTT 143	Fundamentals of Drafting	2
MTT 133	Metallurgy	3
QCT 115	Basic Coordinate Measuring Machine	1
QCT 116	Advanced Coordinate Measuring	1
QCT 141	Statistical Process Control	1

### NUMERICAL CONTROL TECHNOLOGY (23 credits)

CAD 131	Computer Assisted Drafting I	3
MTT 105	Machine Tool Technology I	4
MTT 106	Machine Tool Technology II	4
NCT 121	Introduction to Numerical Control	2
NCT 122	Programming for Numerical Control	3
NCT 123	Numerical Control Machine Tool Operations	.3
NCT 232	Intro to MasterCAM-Mill	2
NCT 234	Intro to MasterCAM-Lathe	2

### TECHNICAL ELECTIVES

Select classes from CAD, EET, MTT, NCT, or WLD to meet your 60 credit degree requirement.

## Numerical Control Technology Certificate

Students pursue initial studies in Numerical Control Machining and Numerical Control Programming.

Minimum credits: 31  
 Minimum cumulative GPA: 2.0  
 Minimum JCC credits: 12  
 MACRAO agreement: No

### NUMERICAL CONTROL TECHNOLOGY

<b>REQUIREMENTS (28 Credits)</b>		
CAD 131	Computer Assisted Drafting I	3
ITE 083	Windows Workshop	1
MTH 120	Beginning Algebra	4
MTT 105	Machine Tool Technology I	4

MTT 106	Machine Tool Technology II . . . . .	4
NCT 121	Introduction to Numerical Control . . . . .	2
NCT 122	Programming for Numerical Control . . . . .	3
NCT 123	Num Con Machine Tool Operations . . . . .	3
NCT 232	Introduction to MasterCam - Mill . . . . .	2
NCT 234	Introduction to MasterCam - Lathe . . . . .	2

**TECHNICAL ELECTIVES**

Select classes from CAD, MTT, NCT, or WLD to meet your 31 credit certificate requirement

# Apprenticeship Information and Related Trade Instruction

## Apprenticeship

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 additional information, call Apprenticeship Office (517) 796-8435

## Related Trade Instruction (RTI)

### Program Goals:

1. Provide comprehensive trade-related instruction for apprentices.
2. Provide industry a convenient location for training their employees.
3. Promote and maintain well-trained and skilled manpower for business and industry.
4. Promote and encourage life-long skill and knowledge development in all skill areas necessary for both the worker and employer in a time of rapidly changing technology.

## Apprenticeship and Related Trades Available

These trades are certificate and apprenticeship programs. Call Technology and Learning Center (TLC) at 796-8435 for detailed information about the related trades programs.

- Die Design
- Die Maker
- Electrician

- Industrial Maintenance Mechanic
- Institutional Maintenance Mechanic
- Machine Builder
- Machine Repair
- Machinist
- Millwright
- Moldmaker
- Tool Designer
- Tool and Die Maker
- Tool Maker
- Machine Operator I\*
- Machine Tool Set-Up Operator\*
- NC Machine Tool Operator\*
- Welder\*

*\*Certificates are not available for Machine Operator I, Machine Tool Set-Up Operator, NC Machine Tool Operator and Welder. These titles are available as Apprenticeships*

## Levels of Completion

Levels of Completion is a building-block approach to learning. See complete information after trades certificate listings.

## Apprentice Note

If a student is a registered apprentice, courses may vary from the certificate curriculum. Please consult with student employed company for the required courses for its apprenticeship program and minimum grade requirements. Course substitutions may be requested by the company or the College as result of the apprentice's previous schooling, experience, schedule conflicts, etc. Changes to an apprenticeship curriculum will be made only with company notification and approval. Requisite requirements may be waived by the instructor or through testing.

## Enrollment

Enrollment forms can be completed through the Apprenticeship and RTI Office in Whiting Hall, Main Campus.

## Who May Enroll:

- Adult students who desire to improve their working knowledge through related trade instruction
- Individuals required to attend specific classes as part of a company training program
- Working adults in training
- Any individual who can profit from instruction

# Associate in Applied Science

(In any of the following skilled trades)

- Die Design
- Die Maker
- Electrician
- Industrial Maintenance Mechanic
- Institutional Maintenance Mechanic
- Machine Builder
- Machine Repair
- Machinist
- Millwright
- Moldmaker
- Tool Designer
- Tool and Die Maker
- Tool Maker

Minimum credits: 60  
Minimum cumulative GPA: 2.0  
Minimum JCC credits: 12  
MACRAO agreement: No

## GENERAL EDUCATION REQUIREMENTS (17 credits)

### ENGLISH (3 credits)

ENG 131 Writing Experience ..... 3

### MATHEMATICS (3 credits)

MTH 131 Intermediate Algebra or higher ..... 3

### SCIENCE (4 credits)

PHY 231 College Physics I ..... 4

### SOCIAL SCIENCE (3 credits)

Choose one of the following:

PLS 141 American National Government ..... 3

ECN 231 Macroeconomics ..... 3

### HUMANITIES (3 credits)

Choose one of the following:

PHL 231 Introduction to Philosophy ..... 3

PHL 232 Logic ..... 3

### HEALTH/PHYSICAL FITNESS (1 credit)

Choose one of the following:

HPF 160 Wellness ..... 1

HPF 168 Weight Training & Conditioning ..... 2

HPF 221 Jazz Techniques ..... 3

HPF 277 Stress Management ..... 2

HPF 278 Stress Management for Parents ..... 2

## TECHNICAL REQUIREMENTS

Students must complete the technical required courses for the trade. This coursework varies from 40-48 credits of Related Trade Instruction.

### ELECTIVES

Complete elective credits in any discipline to reach 60 credits.

## Die Designer Certificate

Minimum credits: 44  
Minimum cumulative GPA: 2.0  
Minimum JCC credits: 12  
MACRAO agreement: No

### REQUIRED COURSES

RTI 012	Math II - Algebra	..... 2
RTI 013	Math III - Geometry	..... 2
RT 020	Blue Print Reading I	..... 2
RTI 050	Machine Theory I	..... 2
RTI 051	Machining Theory	..... 2
RTI 028	Drafting	..... 2
RTI 014	Math IV - Trigonometry	..... 2
RTI 021	Blue Print Reading II	..... 2
RTI 054	Machining Methods	..... 4
RTI 260	Industrial Physics	..... 2
RTI 090	Machinery Handbook	..... 2
RTI 070	Basic Industrial Electricity	..... 2
RTI 031	Jigs & Fixture Design	..... 2
RTI 052	Theory of Programming NC Machine Tools	..... 2
RTI 080	Metallurgy & Heat Treatment	..... 2
RTI 053	Theory of Chipless Machining	..... 2
RTI 163	Hydraulics/Pneumatics	..... 2
RTI 030	Die Theory and Design I	..... 4
RTI 034	Die Theory and Design II	..... 4

### ADDITIONAL REQUIREMENTS

EMS 110 CPR & First Aid ..... 2  
or current Adult CPR & First Aid Certification

## Die Maker Certificate

Minimum credits: 40  
Minimum cumulative GPA: 2.0  
Minimum JCC credits: 12  
MACRAO agreement: No

### REQUIRED COURSES

RTI 012	Math II - Algebra	..... 2
RTI 013	Math III - Geometry	..... 2
RTI 020	Blue Print Reading I	..... 2
RTI 050	Machine Theory I	..... 2
RTI 051	Machining Theory	..... 2
RTI 028	Drafting	..... 2
RTI 014	Math IV - Trigonometry	..... 2

RTI 021	Blue Print Reading II	2
RTI 054	Machining Methods	4
RTI 090	Machinery Handbook	2
RTI 260	Industrial Physics	2
RTI 031	Jig & Fixture Design	2
RTI 052	Theory of Programming NC Machine Tools	2
RTI 080	Metallurgy & Heat Treatment	2
RTI 053	Theory of Chipless Machining	2
RTI 030	Die Theory and Design I	4
RTI 034	Die Theory and Design II	4

**ADDITIONAL REQUIREMENTS**

EMS 110	CPR & First Aid	2
or current Adult CPR & First Aid Certification		

## Electrician Certificate

Minimum credits: 41  
 Minimum cumulative GPA: 2.0  
 Minimum JCC credits: 12  
 MACRAO agreement: No

**REQUIRED COURSES**

RTI 147	Basic Electrical Math	2
RTI 150	Residential Wiring	2
RTI 148	Electrical Math I	2
RTI 153	Fundamentals of Direct Current	2
RTI 151	Commercial Wiring	2
RTI 149	Electrical Math II	2
RTI 152	Industrial Wiring	2
RTI 154	Fundamentals of Alternating Current	3
RTI 146	Basic Servo Systems	2
RTI 346	Electrical Motors and Controls	4
RTI 157	Basic Programmable Controllers	4
RTI 215	Electrical Troubleshooting	2
RTI 163	Hydraulics/Pneumatics	2
RTI 155	Industrial Electronics I	4
RTI 156	Industrial Electronics II	4
RTI 074	National Electric Code	2

**ADDITIONAL REQUIREMENTS**

EMS 110	CPR & First Aid	2
or current Adult CPR & First Aid Certification		

## Industrial Maintenance Mechanic Certificate

Minimum credits: 40  
 Minimum cumulative GPA: 2.0  
 Minimum JCC credits: 12  
 MACRAO agreement: No

**REQUIRED COURSES**

RTI 147	Basic Electrical Math	2
RTI 070	Basic Industrial Electricity	2
RTI 018	Industrial Print Reading	2
RTI 036	Drive Components and Bearings	2
RTI 163	Hydraulics/Pneumatics	2
RTI 148	Electrical Math I	2
RTI 151	Commercial Wiring	2
RTI 149	Electrical Math II	2

RTI 152	Industrial Wiring	2
RTI 215	Electrical Troubleshooting	2
RTI 081	Welding I	4
RTI 346	Electrical Motors and Controls	4
RTI 038	Pumps	2
RTI 082	Welding II	4
RTI 261	Maintenance Troubleshooting	2
or RTI 260	Industrial Physics	2
RTI 096	Lubricants and Coolants	2
RTI 080	Metallurgy & Heat Treatment	2

**ADDITIONAL REQUIREMENTS**

EMS 110	CPR & First Aid	2
or current Adult CPR & First Aid Certification		

## Institutional Maintenance Mechanic Certificate

Minimum credits: 41  
 Minimum cumulative GPA: 2.0  
 Minimum JCC credits: 12  
 MACRAO agreement: No

**REQUIRED COURSES**

RTI 018	Industrial Print Reading	2
RTI 147	Basic Electrical Math	2
RTI 148	Electrical Math I	2
RTI 149	Electrical Math II	2
AIT 121	Intro to HVAC	3
RTI 074	National Electric Code	2
RTI 151	Commercial Wiring	2
RTI 215	Electrical Troubleshooting	2
RTI 096	Lubricants and Coolants	2
AIT 141	Basic Heating	2
RTI 153	Fundamentals of Direct Current	2
RTI 163	Hydraulics/Pneumatics	2
RTI 154	Fundamentals of Alternating Current	3
RTI 038	Pumps	2
RTI 036	Drive Components and Bearings	2
RTI 260	Industrial Physics	2
RTI 346	Electrical Motors and Controls	4
AIT 135	Refrigeration I	3

**ADDITIONAL REQUIREMENTS**

EMS 110	CPR & First Aid	2
or current Adult CPR & First Aid Certification		

## Machine Builder Certificate

Minimum credits: 42  
 Minimum cumulative GPA: 2.0  
 Minimum JCC credits: 12  
 MACRAO agreement: No

**REQUIRED COURSES**

RTI 012	Math II - Algebra	2
RTI 051	Machining Theory	2
RTI 054	Machining Methods	4
RTI 020	Blue Print Reading I	2
RTI 013	Math III - Geometry	2
RTI 014	Math IV - Trigonometry	2





