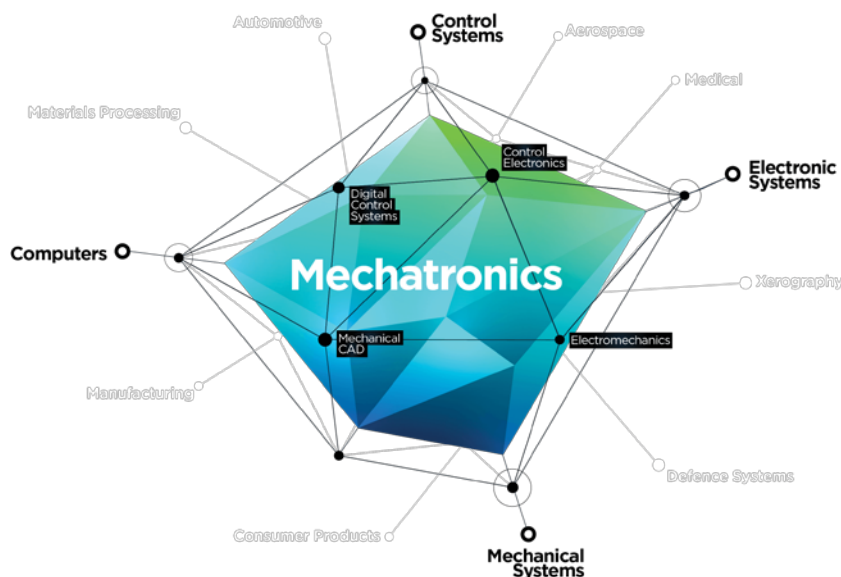


# MECHATRONICS TECHNOLOGY

## MASTER PLAN OF INSTRUCTION 2020 - 2021 Ernest White, Instructor



### MISSION

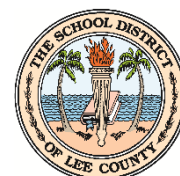
The mission of Fort Myers Technical College is to provide high quality career and technical training, in order to prepare students for current and emerging industries, delivered by a professional and caring staff in a positive learning environment.

The School District of Lee County does not discriminate on the basis of race, color, national origin, gender, age, disability, marital status, pregnancy, or genetic information in its educational programs, services or activities, or in its hiring or employment practices. The district also provides equal access to its facilities to the Boy Scouts and other patriotic youth groups, as required by the Boy Scout of America Equal Access Act. Questions, complaints, or requests for additional information regarding discrimination or harassment may be sent to: Equity Coordinator, Fort Myers Technical College, 3800 Michigan Ave., Fort Myers, FL 33916, (239) 334-4544.

Lack of English language skills will not be a barrier to admission and participation. The district may assess each student's ability to benefit from specific programs through placement tests and counseling, and, if necessary, will provide services or referrals to better prepare students for successful participation.



**Fort Myers Technical College**  
3800 Michigan Avenue  
Fort Myers, FL 33916  
(239) 334-4544



# **Mechatronics Technology**

## **INTRODUCTION**

The purpose of this program is to provide students the opportunity for employment in a variety of electronic/mechanical related occupations. After completing the 1550 hour program, students are prepared to assemble, install, maintain, troubleshoot and repair electrical/electronic/mechanical equipment in the industry.

Materials used are self-paced which allow students to progress at their own pace. Competencies in each area are completed after both written and performance testing.

## **PROGRAM MISSION**

The mission of the Mechatronics Program is to prepare students for employment as an Industrial Electronics Technician in the local community. With a broad knowledge base, many area of employment are possible. Students are encouraged to obtain Industry certification as Certified Electronics Technician associate (CETa) and Industrial Technician in Electronics Technicians Association, International (ETA)

## **PROGRAM PHILOSOPHY**

This program is a combination of classroom instruction using the most up-to-date textbooks, computers, software, and equipment available. The student is eligible to test for certification by the Electronic Technician Associate (CETa), Industrial Technician at Electronics Technicians Association, International. After completing the Mechatronics Technology program, the student is prepared to enter the workforce as electrical/electronic/mechanical technician. The student may also choose to continue their education in any of the pre-Electrical Engineering disciplines.

## **PROGRAM CONTENT**

- Demonstrate Proficiency in Soldering and Basic Laboratory Practices
- Demonstrate Proficiency in Basic Direct Current (DC) Circuits
- Demonstrate Mathematics Knowledge and Skills
- Demonstrate Science Knowledge and Skills
- Use Oral and Written Skills in Creating, Expressing, and Interpreting Information and Ideas
- Demonstrate Proficiency in Advanced Direct Current (DC) Circuits
- Demonstrate Proficiency in Alternating Current (AC) Circuits
- Demonstrate Proficiency in Solid State Devices
- Demonstrate proficiency in industrial 3 phase electricity, motors and motor control circuits.
- Demonstrate Proficiency in hydraulic and pneumatic systems.
- Demonstrate Proficiency in mechanical power transmission systems.
- Demonstrate Proficiency in mechanisms, linkages and levers.
- Demonstrate Proficiency in automatic controls and robotics.
- Solve Problems Using Critical Thinking Skills
- Demonstrate Importance of Health, Safety and Environmental Management
- Use Information Technology Tools
- Describe the Importance of Professional Ethics and Legal Responsibilities
- Demonstrate Skills in Technical Recording

- Describe the Roles within Teams, Work Units, Departments, and Organizations Inter-Organizational Systems, and Larger Environments
- Demonstrate Leadership and Teamwork Skills Needed to Accomplish Team Goals and Objective
- Explain the Importance of Employability and Entrepreneurship Skills

## **ESSENTIAL TRAINING TASKS**

### **Physical Requirements**

Student must have the following: good hand-eye coordination, able to grasp small objects, good manual dexterity, able to see colors, assemble objects and parts, and move freely to observe and evaluate projects.

### **Cognitive Requirements**

Students must be able to follow written and oral instructions; interpret electrical schematics and mechanical drawings; have excellent communication and troubleshooting skills; be able to interpret test results to determine circuit faults; be a team player; and work well with others.

## **ACCOMMODATIONS**

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's IEP or 504 plan or post-secondary student's accommodations plan to meet individual needs to ensure equal access. Post-secondary students with disabilities must self-identify, present documentation, required accommodations if needed, and develop a plan with their post-secondary service providers. Accommodations received in post-secondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology, and special communication systems. Documentation of the accommodations requested and services provided are maintained in a confidential file.

## **TUITION**

Tuition is charged for adult students at a reasonable rate that may vary slightly from year to year and is due prior to the first day of each semester. Current fee information is available from Student Services. Tuition is waived for eligible high school dual-enrolled students. Failure to pay all fees due at the time class begins will result in the student not being able to attend class and/or clinical.

## **CLASS SCHEDULE**

Daytime certificated classes meet Monday through Friday from 8:00 A.M. until 2:30 P.M. This amounts to 30 hours of classroom instruction per week. Lunch breaks are 30 minutes in length.

## **ATTENDANCE POLICY**

In an effort to develop appropriate employability skills, FMTC students are expected to attend all class sessions. As is expected in the workplace, when it is necessary to be absent due to illness or emergency situations, all students are to notify the instructor on or before the date of absence. The student attendance policy for each post-secondary program is consistent with industry standards.

Campus attendance is kept via a computerized system. It is the responsibility of the student to **log in and out** in order to receive credit for class time. This allows the school to keep accurate attendance records for the actual number of hours and minutes attended.

All adult students are expected to be in attendance at least 90% of their scheduled hours during each semester. Adult students failing to maintain the 90% attendance standard may not be permitted to continue in their program and may be required to sit out one full semester, unless administration approves to waive the 90% standard based on special circumstances.

## **Absences**

A student who is absent for 6 consecutive class sessions, without prior approval and without contact with the instructor, will be withdrawn from enrollment in his/her program. A student withdrawn for absenteeism must petition administration to return. Students exhibiting a pattern of consecutive absences of 4 days may be subject to dismissal as determined by a School Intervention Team. School Intervention Team meetings will be held as necessary to attempt to alleviate issues resulting in excessive absences and to counsel the student of possible alternatives and consequences.

Students, who are late for class, including returning late from lunch, must clock in. Students who leave school early must notify their instructor and clock out. This time out of class is recorded as time absent and is counted against the required 90% attendance. Excessive tardies or early departures will be reported to the Student Affairs Specialist and will result in a meeting with the School Intervention Team.

Adult students who know they will be out of school for an extended period of time (4 days or longer) may apply for a Leave of Absence from their program. A Leave of Absence will be granted only once during a twelve-month period. STUDENTS WHO EXERCISE A LEAVE OF ABSENCE MAY HAVE TO EXTEND THEIR TIME IN THEIR PROGRAM AND PAY ADDITIONAL FEES.

## **Leaving Campus During School Hours**

Students must notify their instructor when leaving campus early. This is for the safety of students, to accurately track time, and to allow the instructor to best utilize instructional resources.

## **PLAN OF INSTRUCTIONAL PRACTICES**

### **Teaching Methods**

Teaching methods include lectures, demonstrations, hands-on training activities, online video training and presentations, virtual simulations, outside speakers from job-related businesses and industries, field trips, projects, co-op assignments with local businesses and manufacturing facilities.

### **Safety**

Follow established electrical safety procedures and standards. No horseplay or unsafe conduct is acceptable.

### **Work-Based Activities**

Work-based learning activities play an integral part of the curriculum of FMTC's career-technical training programs. These activities are planned with two objectives in mind. First, the activity provides students with the opportunity to develop and apply 'real world' experience using the knowledge and skills attained in the program. Second, the activity provides the instructor with objective input from potential employers or customers of program graduates. Each work-based activity has a written instructional plan outlining objectives, experiences, competencies, and evaluation required during the activity.

### **Cooperative Education**

Cooperative training is available for students and coordinated by the instructor and career specialist. Cooperative training is for students who have shown competence in program training that indicates readiness for placement in an on-the-job program. High school students participating in the cooperative job placement program must be in the 12<sup>th</sup> grade. To be eligible for a cooperative education experience, students must have completed one-half of the required program hours and requirements.

Students may be returned to the program for additional training if they do not function satisfactorily on the job or when the cooperative agreement is terminated at the request of the student, parent, employer, or program instructor. Veterans will be accepted in the program in accordance with the Department of Veterans Affairs approved program.

Additional information regarding cooperative training opportunities may be obtained from the program instructor or career specialist.

## **Job Shadowing**

Job shadowing experiences, or volunteer experiences, are available to students as part of their program training. These experiences are designed to give the student actual hands-on experiences doing a variety of related tasks. Length and type of experiences will vary. The program instructor determines appropriateness of the experience. Additional information regarding job-shadowing experiences may be obtained from the program instructor or career specialist.

## **GRADING PROCEDURES**

Student evaluations are based on a weekly Student Progress Report that is filled out by the student and concurred with the instructor. A five week interim report is also completed based on the weekly reports and finally the semester quarterly report. This allows the student to know exactly where they are at any given point in time. The grading policy for the Mechatronics Technology program at Fort Myers Technical College is as follows:

Academic Progress – OCPs Exams	60% total weekly grade
Attendance -Employability Skills	15 % total weekly grade
Labs	25% total weekly grade

Each category is given a weekly grade and put into the Focus grade book. The grades are recorded in Focus and included as part of the student's permanent record.

Fort Myers Technical College is a post-secondary institute designed to provide trained individuals to industry. The approved post-secondary program grading requirements must be met if the student is to receive a certificate.

## **Program Progress**

Students are required to complete the program of training within the hours allotted by the state of Florida for completion. Progress must be at a rate that will allow completion of the program with the number of membership hours stated in the Curriculum Frameworks.

Failure to progress at this rate will require the student to meet with the program instructor, career specialist, and an administrator in order to identify an appropriate completion point or to assist the student in selecting a more appropriate training program.

## **Work Habits**

Effective work habits are the cornerstone to successful employment. Students are expected to demonstrate productive work habits during all phases of enrollment. Instructors will work with students who need assistance in this area to improve the overall possibility for successful employment.

**Attendance:** Attends class, arrives/leaves on time; begins and ends work as expected.

**Character:** Displays loyalty, honesty, trustworthiness, dependability, reliability, initiative, self-discipline, and self-responsibility; displays a high level of effort and commitment to performing and completing work.

**Teamwork:** Respects the right of others; respects confidentiality; is cooperative; is assertive; displays a customer service attitude; seeks opportunities for continuous learning; demonstrates mannerly behavior; encourages and facilitates cooperation, pride, trust, and group identity; fosters commitment and team spirit.

**Appearance:** Displays appropriate dress, grooming, hygiene, and etiquette; wears full regulation uniform.

**Attitude:** Displays a willingness to cooperate and accept constructive criticism; sets realistic expectations; approaches assignments with interest.

**Productivity:** Is prepared for class by reading assignments and completing homework; contributes to class discussions; and involvement in lab activities (in other words, no sleeping or daydreaming). Follows safety practices; conserves and maintains equipment and supplies; keeps work area neat and clean; follows directions and procedures; makes up assignments and tests punctually; notifies proper authorities of situations presenting potential safety hazards; does not use or knowingly permits others to use tools and equipment improperly; stays on task and utilizes time constructively.

**Organization:** Manifests skill in prioritizing and management of time and stress; demonstrates flexibility in adapting to changes.

**Communication:** Communicates accurate information to others in a professional and courteous manner; displays appropriate nonverbal (eye contact, body language) and oral (listening, telephone etiquette, grammar) skills; asks pertinent questions; listens attentively to others, notifies instructor in advance of absences or tardies.

### **SATISFACTORY ACADEMIC PROGRESS**

In order to receive and continue to receive financial assistance of any type, a student must maintain satisfactory academic progress. The Financial Aid Advisor will require a progress report to be completed by the student's instructor and submitted to the Financial Aid Office prior to each disbursement.

Students are considered to be making Satisfactory Academic Progress (SAP) if they successfully complete their scheduled clock hours, achieve a specific cumulative grade evaluation or grade point average (GPA), and do not exceed the maximum time limits to complete their course of study. Each Student Academic Progress will be checked at 450 clock hours and prior to subsequent disbursements for students enrolled in programs one academic year or greater. Progress will be checked at the half-way point for programs less than one academic year. No SAP is required prior to the first disbursement.

### **REQUIREMENTS FOR A CERTIFICATE**

All competencies specified in the state of Florida Curriculum Frameworks for the program must be successfully completed. Successful completion is at least a 75% average in the areas of skills, knowledge, and work habits.

Proficiency in the competency standards listed in the Master Plan of Instruction must be demonstrated.

Students must meet minimum T.A.B.E. skill requirements (or qualify for an exemption) prior to graduation.

In addition to the requirements above, the recommendation of the instructor for certification includes: consideration of employability skills, personal appearances, a willingness to learn and to work, punctuality, cooperative attitude, and appropriate work habits.

### **MECHATRONICS TECHNOLOGY STUDENT DRESS CODE**

Students who attend FMTC shall dress in a manner appropriate for the job in which they are receiving training, including any special protective gear and professional uniforms. All clothing must be neither distracting nor offensive and be clean, neat, modest, in good repair, and appropriately sized.

Administration has the final authority for determining whether or not a student's apparel conforms to the dress code. When it is determined that it does not, students will be required to change into appropriate clothing.

**Dress Code/Uniforms Required:** The dress code policy states, program designated business attire: collared shirts (buttoned and tucked into pants at the waist), slacks (no jeans), appropriate length skirts or dresses, sleeved blouses or shirts, appropriate shoes (no tennis shoes), fully laced. All students read, agree to abide by the rules and sign the dress code policy.

### **OCP DESCRIPTIONS**

#### **Occupational Completion Point A – Electronics Assembler Course #EEV0010**

- 01.0 Demonstrate Proficiency in Soldering and Basic Laboratory Practices
- 02.0 Demonstrate Proficiency in Basic Direct Current (DC) Circuits

## **Occupational Completion Point B – Electronics Tester**

### **Course #EEV0100**

- 03.0 Demonstrate Proficiency in Advanced Direct Current (DC) Circuits
- 04.0 Demonstrate Proficiency in Alternating Current (AC) Circuits
- 05.0 Demonstrate Proficiency in Solid State Devices

## **Occupational Completion Point C – Electromechanical Assembler**

### **Course #EEV0752**

- 06.0 Demonstrate proficiency in industrial 3 phase electricity, motors and motor circuits.
- 07.0 Demonstrate proficiency in hydraulic and pneumatic systems.
- 08.0 Demonstrate proficiency in mechanical power transmission systems.
- 09.0 Demonstrate proficiency in mechanisms, linkages and levers.

## **Occupational Completion Point D – Mechatronic Technician**

### **Course #EEV0753**

- 10.0 Demonstrate proficiency in automatic controls and robotics.

### **JOB DESCRIPTIONS**

All students are strongly encouraged to become full program completers and become certified electronics technicians by passing the Electronics Technicians Association International certification test. In cases where students are unable to complete the entire program the following opportunities are available:

#### **OCP A            Electronics Assembler (250 Hours)**

Students completing OCP A will be able to obtain employers as assemblers/disassemblers for firms in the electronics industry.

#### **OCP B            Electronics Tester (400 Hours)**

Students working as electronic testers would be able to follow established test procedures ensuring that both incoming purchased parts and manufactured parts meet engineering specifications. They will be able to maintain quality control performance charts and write detailed reports for managements review.

#### **OCP C            Electromechanical Assembler (500 Hours)**

A completer of Electromechanical Assembler would be able to perform the tasks of an electronics assembler or an electronics tester plus be able to troubleshoot and repair electronic/mechanical equipment. They would also be able to meet with customers and vendors to discuss repairs or necessary circuit revisions.

#### **OCP D            Mechatronic Technician (400 Hours)**

A completer of Mechatronics Technician would be able to design, build, troubleshoot and repair complex electronic/mechanical circuits. They would have excellent organizational skills, be able to train team members and possess leadership capabilities.

### **TEXTBOOKS**

For the most recent book list for the Mechatronics Technology program, visit FMTC's online bookstore – [www.fmtcshop.com](http://www.fmtcshop.com). **(Do not purchase books for future semesters, only for CURRENT semester).**

### **REQUIRED MATERIALS**

Paper, pencils, pens, and erasers.

### **PROGRAM OBJECTIVES**

See the attached Florida Department of Education Curriculum Frameworks for program objectives and competencies.

**Florida Department of Education  
Curriculum Framework**

**Program Title:** Mechatronics Technology  
**Program Type:** Career Preparatory  
**Career Cluster:** Manufacturing

<b>PSAV</b>	
Program Number	J200200
CIP Number	0615049901
Grade Level	30, 31
Standard Length	1550 Hours
Teacher Certification	AUTO PROD 7G                      AVIONICS @7 7G ELECTRONIC @7 7G                ENG 7G IND ENGR 7G                        ROBOTICS 7G
CTSO	SkillsUSA
SOC Codes (all applicable)	49-2094 – Electrical and Electronics Repairers, Commercial and Industrial Equipment 51-2022 – Electrical and Electronic Equipment Assemblers 51-2023 – Electromechanical Equipment Assemblers
CTE Program Resources	<a href="http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml">http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml</a>
Basic Skills Level	Mathematics:                      10 Language:                            9 Reading:                              10

**Purpose**

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the manufacturing career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the manufacturing career cluster.

**Mechatronics** is the combination of Mechanical, Electronic, Computer, Software, Control, and Systems Design engineering in order to design and manufacture useful products. Mechatronics is a multidisciplinary field of engineering,

The program is designed to provide graduates with a high-tech skill set and knowledge in electronic, mechanical, fluid power/pneumatic systems, electrical, Program Logic Controller applications (PLC) programming, computer technology for maintenance and repair of PLC / computer controlled, automated machines and robotic systems.

The content includes but is not limited to Direct current (DC) circuits, alternating current (AC) circuits and analog circuits; solid state and digital devices; microprocessors; use of circuit diagrams, blueprints and schematics; soldering and chassis assembly techniques; laboratory practices, technical recording and reporting. The operation, maintenance and repair of electrical equipment and control systems, hydraulic/pneumatic systems, and mechanical systems: gears, drives, linkage and lever systems,



computers, Programmable Logic Controller (PLC) programming, process control systems, automated control and integrated robotic systems.

### **Program Structure**

This program is a planned sequence of instruction consisting of four occupational completion points.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3)(b), F.S.

The following table illustrates the **PSAV** program structure:

OCP	Course Number	Course Title	Course Length	SOC Code
A	EEV0010	Electronics Assembler	250 hours	51-2022
B	EEV0100	Electronics Tester	400 hours	51-2022
C	EEV0752	Electromechanical Assembler	500 hours	51-2023
D	EEV0753	Mechatronic Technician	400 hours	49-2094

### **Common Career Technical Core – Career Ready Practices**

Career Ready Practices describes the career-ready skills that educators should seek to develop in their students. These practices are not exclusive to a Career Pathway, program of study, discipline or level of education. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study.

1. Act as a responsible and contributing citizen and employee.
2. Apply appropriate academic and technical skills.
3. Attend to personal health and financial well-being
4. Communicate clearly and effectively and with reason.
5. Consider the environmental, social and economic impacts of decisions.
6. Demonstrate creativity and innovation.
7. Employ valid and reliable research strategies.
8. Utilize critical thinking to make sense of problems and persevere in solving them.
9. Model integrity, ethical leadership and effective management.
10. Plan education and career paths aligned to personal goals.
11. Use technology to enhance productivity.
12. Work productively in teams while using cultural global competence.

### **Standards**

After successfully completing this program, the student will be able to perform the following:

- 01.0 Demonstrate proficiency in soldering and basic laboratory practices.
- 02.0 Demonstrate proficiency in basic D.C. circuits.
- 03.0 Demonstrate proficiency in advanced D.C. circuits.
- 04.0 Demonstrate proficiency in A.C. circuits.
- 05.0 Demonstrate proficiency in solid state devices.
- 06.0 Demonstrate proficiency in motors and motor control circuits.
- 07.0 Demonstrate proficiency in hydraulic and pneumatic systems.
- 08.0 Demonstrate proficiency in mechanical power transmission systems
- 09.0 Demonstrate proficiency in mechanisms, linkages and levers.
- 10.0 Demonstrate proficiency in automatic controls, robotics and PLC programming.