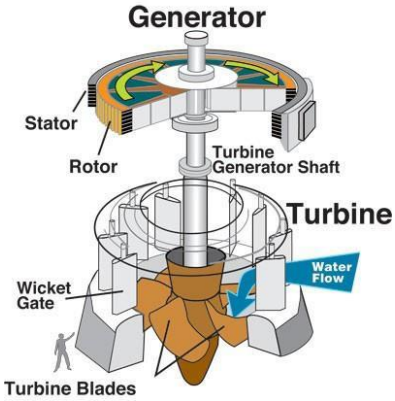
TURBINE GENERATOR MAINTENANCE, INSPECTION AND REPAIR

MASTER PLAN OF INSTRUCTION
2021 – 2022

Todd Regan, 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.

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

Turbine Generator Maintenance, Inspection, and Repair

INTRODUCTION

The Turbine Generator Maintenance, Inspection, and Repair program is a 1350-hour program responsible for training individuals to attain an entry-level status in the power generation maintenance industry. The program covers a broad rangeof instruction that may be found in the program outline. An appropriate amount of time is spent in each area to thoroughly cover needed instructional material as well as to gain manipulative skills. The program utilizes both theory and practical application of material to help the students gain needed knowledge and skills. Each student must successfully complete written test material on theory and related topics as well as successfully demonstrate the practical application of this information in the laboratory environment. Prerequisites for this program should include a solid background in math and science in general with emphasis on basic math, formulas, fraction and decimal conversion, and the use of precision measuring equipment, physics, chemistry and metallurgy. These areas are taught as part of the program of study, but it would be helpful to have these skills in advance. Materials used are self-paced which allow students to progress at their ownpace. Competencies in each area are completed after both written and performance testing.

PROGRAM MISSION

The mission of the Turbine Generator Maintenance, Inspection, and Repair program is to prepare students for employmentin the power generation maintenance mechanic field.

PROGRAM PHILOSOPHY

- We believe in education and work.
- We believe in careful assessment of abilities and interests so that all students, including those with special needs,may formulate realistic occupational goals.
- We believe in equal access to training programs and in providing comprehensive support services
- We believe in providing an active learning environment that develops technical skills, academic skills, and effectivework habits.
- We believe in continuous program and curriculum revision based on input from employers, advisory committeemembers, concerned citizens, students, and school personnel.
- We believe in innovative teaching methods that prepare students to meet industry standards.
- We believe in lifelong learning, responsible citizenship, and promoting individual self-worth to help our studentsbecome productive citizens in today's global society.

PROGRAM CONTENT

The program content for the Turbine Generator Maintenance, Inspection, and Repair program is as follows:

- Health, safety, and environmental issues
- Industrial – turbine generator equipment maintenance
- Precision measuring equipment
- Plumbing
- Management
- Cost management skills
- Technical and production skills
- Principles of technology
- Labor issues

ESSENTIAL TRAINING TASKS

Physical Requirements
Ability to:

- Maintain a high degree of manual dexterity
- Stoop
- Kneel
- Lift at least 50 pounds and walk with it
- Use voice, hearing and sight effectively to perform jobs
- Crouch or bend
- High degree of finger dexterity
- Crawl
- Differentiate colors
- Handle and manipulate supplies
- Use depth perception
- Work in an atmosphere of loud noise
- Work in an atmosphere of changes in temperature
- Perform repetitive tasks
- Measure accurately
- Work without close, direct supervision
- Work on multiple tasks and priorities
- Perform and complete tasks of relative complexity

Cognitive Requirements
Mental and Emotional Requirements:

- Handle confrontation and frustration and assist in problem solving
- Interpret a variety of instructions furnished in written, oral, and diagrammatic form
- Collaborate with others
- Cope with high levels of stress
- Perform mathematical computations at a level of tenth grade or higher
- Make fast decisions under pressure
- Demonstrate a high degree of patience
- Read and understand precision measuring devices and related equipment
- Work in close or crowded areas

ACCOMMONDATIONS

Federal and state legislation requires the provision of accommodations for student 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 provider. 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 andassessments, 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 firstday of each semester. Current fee information is available from Student Services. Failure to pay all fees due at the time classbegins 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. for adult post-secondary students.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 notifythe instructor on or before the date of absence. The student attendance policy for each post-secondary program is consistentwith 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 andminutes attended.

All adult students are expected to be in attendance at least 90% of their scheduled hours during each semester. Adult studentsfailing 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, willbe 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 Security Specialist and will result in a meetingwith 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 Leaveof Absence from their program. A Leave of Absence will be granted only once during a twelve-month period. STUDENTSWHO EXERCISE A LEAVE OF ABSENCE MAY HAVE TO EXTEND THEIR TIME IN THEIR PROGRAM AND PAY ADDITIONAL FEES.

Leaving Campus During School Hours

Students should 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

Material used is self-paced and competency-based. Students proceed at their own pace with written, audio-visual, and hands-on training. They are tested periodically with written and practical testing. Practical shop experiences are designed to enhance and reinforce the theories involved as well as to develop manipulative skill and good work and safety practices. Teaching aids utilizing digital presentations, DVDs, CBTs, etc., are used to a great extent throughout all instruction. Wall charts, specification charts, and other reference materials are on constant display throughout the classroom and laboratory.A great deal of equipment must be utilized for “hands-on” skill requirements. The students will acquire rapport in workingwith such equipment. Materials are reviewed and updated periodically to keep them as current and as relevant as possible. Students are made responsible for all laboratory requirements such as maintaining tools, equipment, and facilities, writing all required job reports, tool room management, and cleanup of shop areas.

Safety
A basic outline of safety standards and practices is covered the first week of class along with a continuous implementationof safety principles. Students will also need to receive their OSHA 10, Twic, and in some states, Basic Plus.

Evaluation
Class performance, quizzes, tests, attendance, portfolio assessments, completion of project assignments, decision-making,work habits, achievement of entry-level competencies, and other methods are used for evaluation.

Work-Based Activities
Work-based learning activities play an integral part of the curriculum of FMTC's career-technical training programs. Theseactivities are planned with two objectives in mind. First, the activity provides students with the opportunity to develop andapply '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.

Work-based activities are program specific and may include:

- Unpaid in-school shop activities to provide customer service opportunities under the direct supervision of theprogram instructor.
- Unpaid job shadowing experiences that may include in-school or off-campus employer-based experiences underthe supervision of a qualified employer representative who is working closely with the program instructor.
- Paid or unpaid cooperative training experiences conducted at the employer's work location under the supervisionof a qualified employer representative and under the direction of the program instructor.

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. 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 thecooperative agreement is terminated at the request of the student, parent, employer, or program instructor. Veterans will beaccepted into the program in accordance with the Department of Veterans Affairs approved program.

Additional information regarding cooperative 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 experience doing a variety of related tasks. Length and type ofexperiences 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 PROCEDURE

Teacher Grading Procedure

Lab: 30%
Knowledge: 20%
Employability: 50% of the grade comes from the employability score sheet to include the following:

- Tardy
- Absence
- Left early
- Time clock
- Uniform
- Books/tools/computer
- Rules violation
- Late from lunch
- Safety
- ID Badge
- No production
- Professionalism

The grading scale for this program is as follows:

A	90-100%	Excellent
B	80-89%	Above Average
C	70-79%	Average
D	60-69%	Below Average
F	Below 60	At Risk

An average grade of 75% is required to earn an occupational completion point or a certificate of completion. Student grades are determined through the following percentages:

Fort Myers Technical College is a post-secondary institute designed to provide trained individuals to industry. The approvedpost-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 workhabits 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; andinvolvement 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 assignmentsand tests punctually; notifies proper authorities of situations presenting potential safety hazards; does not use or knowinglypermits 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 pertinentquestions; 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 submittedto the Financial Aid Office prior to each disbursement.

Students are considered to be making Satisfactory Academic Progress (SAP) if they successfully complete their scheduledclock hours, achieve a specific cumulative grade evaluation or grade point average (GPA), and do not exceed the maximumtime limits to complete their course of study. Each Student Academic Progress will be checked at 450 clock hours and priorto 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 Florida Department of Education Curriculum Framework 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 appearance, a willingness to learn and to work, punctuality, cooperative attitude, and appropriate work habits.

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 clothing which will conform to this code or leave campus. Students may return to campus when they have changed intoappropriate clothing

Dress Code/Uniform: FMTC uniform grey work shirts (tucked into grey uniform pants at the waist), belt, and steel-toed work boots.

JOB DESCRIPTIONS

OCP A Turbine Generator Maintenance Tech I (450 Hours)
Students that complete OCP A will likely be able to obtain employment as a Millwright/Mechanic helper in industry

relatedcompanies. They will be able to identify safety issues, organize and identify tools, read blue prints, manage money.

OCP B: Turbine Generator Maintenance Tech II (450 Hours)
Students that complete OCP B will likely be able to obtain employment as a Millwright/Mechanic helper in industry relatedcompanies or maintenance mechanic for smaller companies that perform industrial maintenance. They will be able to identify safety issues, organize and identify tools, read blue prints, manage money, understand lubrication, pump maintenance, bolted flanges, removal of galled bolts.

OCP C Turbine Generator Maintenance Mechanic (450 Hours)
Students that complete OCP C are completers of the program and will be able to obtain employment as an entry level steamor gas turbine mechanic/millwright for industry related companies located all over the United States. All of the above and alignment principles, vibration principles, rigging and lifting, control valves, NDE testing, failure analysis, generator maintenance and testing.

REQUIRED MATERIALS & TOOLS

Students must provide their own flash drives.

PROGRAM OBJECTIVES

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

Florida Department of Education
Curriculum Framework

Program Title: **Turbine Generator Maintenance, Inspection and Repair**
Program Type: **Career Preparatory**
Career Cluster: **Energy**

Career Certificate Program	
Program Number	X600500
CIP Number	0715050304
Grade Level	30, 31
Standard Length	1,350 Hours
Teacher Certification	Refer to the **Program Structure** section.
CTSO	SkillsUSA
SOC Codes (all applicable)	49-9041 - Industrial Machinery Mechanics 49-9071 - Maintenance and Repair Workers 51-8013 - Power Plant Operators
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml
Basic Skills Level	Mathematics: 9 Language: 9 Reading: 9

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 energy 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 aspectsof the energy career cluster. This program offers a broad foundation of knowledge and skills to prepare studentsfor employment in industrial-machinery maintenance positions.

The content includes but is not limited to understanding all aspects of the industrial-turbine generator equipment maintenance-technology industry, and demonstrates elements of the industry such as planning, management, cost management skills, technical and production skills, underlying principles of technology, labor issues, and health, safety, and environmental issues.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end ofthis document.

Program Structure

This program is a planned sequence of instruction consisting of three 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 beawarded to the student on a transcript in accordance with Section 1001.44(3)(b), F.S.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for thatcourse.

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length	SOC Code
A	EEV0140	Turbine Generator Maintenance Tech I	TEC CONSTR @7 7G MILLWRIGHT 7 G BLDG CONST @7 7G IND ENGR 7 G	450 Hours	49-9071
B	EEV0141	Turbine Generator Maintenance Tech II		450 Hours	49-9041
C	EEV0142	Turbine Generator Maintenance Mechanic		450 Hours	51-8013

Common Career Technical Core – Career Ready Practices

Career Ready Practices describe 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, 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 path 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:

1. Demonstrate the importance of health, safety and environmental management systems in organizationsand their importance to organizational performance and regulatory compliance.
2. Demonstrate science knowledge and skills and explain the basic elements of physics as related toindustrial machinery maintenance and repair.
3. Explain basic electricity and electronics.
4. Demonstrate mathematics knowledge and skills.
5. Read plans and drawings and identify basic turbine generator nomenclature.
6. Recognize turbine and generator components and subcomponents and describe their function.
7. Plan a turbine generator component inspection.
8. Use turbine generator tooling to maintain and make repairs to Hy-Torq, impact and other hydraulic tools.
9. Demonstrate application of lubricants and lubricating systems.
10. Explain the various fastening mechanisms used on turbine and generator components.
11. Demonstrate tightening operations on high pressure flanges and cylinders.

12. Remove galled bolting and repair of damaged threads.
13. Disassemble and reassemble high speed turbines and generators.
14. Perform machine-shop operations.
15. Demonstrate piping and tubing systems.
16. Understand basic operation of a steam turbine and generator.
17. Perform pump maintenance and repair.
18. Prepare for machinery startup.
19. Perform measuring and rotor alignment operations.
20. Demonstrate Predictive-Preventive-Maintenance (PPM) technologies using a borescope.
21. Perform failure analysis.
22. Generate machine improvements and maintenance management.
23. Perform bench work skills including breakdown and inspection of control valve components.
24. Perform non-destructive examination of turbine components.
25. Understand principals of generator operation and testing.
26. Troubleshoot hydraulic systems.
27. Apply vibration-analysis skills.
28. Perform machinery balancing.