UTAH SYSTEM OF HIGHER EDUCATION

Utah System of Higher Education
Composites
FY2027 / 9 Credits (270 Clock-Hours)

Foundational Courses

TECM 1000 Composite Basics — 2 Credits / 60 Clock-Hours

Composite Basics introduces students to the background and history of composite materials. This course covers introductory topics in general composite manufacturing including composite equipment, materials, methods, safety, tools, vocabulary, and processes for proper and quality-assured composite production.

Objectives:
- Define the basic elements of a composite.
- Practice composite lab safety.
- Distinguish various fibers and resin systems.
- Identify a Safety Data Sheet (SDS) and explain its importance.
- Recognize and describe safety requirements and health hazards related to composite materials and manufacturing.
- Describe and use lay-up tools used in the composite manufacturing process.

TECM 1010 Basic Composite Fabrication — 2 Credits / 60 Clock-Hours

This course will introduce terminology associated with composite fabrication. Students will learn about reinforcement fabrics and resins commonly used in the Composites industry. Students will utilize appropriate processes, properly mix matrix materials, and perform vacuum bag and non-vacuum processes.

Objectives:
- Compare the different techniques used in vacuum bag lay-up and non-vacuum bag lay-ups.
- Demonstrate proper bonding techniques.
- Distinguish and perform the different vacuum bagging techniques and perform successful leak check.
- List and describe the components of a vacuum bagging system.
- Demonstrate correct vacuum bag processes.

TECM 1100 Advanced Composite Materials — 3 Credits / 90 Clock-Hours

This course introduces prepreg materials, terminology, storage, handling practices, clean room etiquette, lay-up methods, and manufacturing techniques for creating high-quality prepreg materials. Students develop skills in identifying foreign object debris (FOD) in finished parts and exploring applications for core materials.

Objectives:
- Apply proper prepreg material techniques.
- Identify different types of core materials.
- Describe and perform characteristics of advanced composite materials.
- Describe and perform proper orientation and a balanced lay-up.

TECM 1110 CNC Composite Processes **2 Credits / 60 Clock-Hours**

The CNC Composites course introduces terminology and vocabulary associated with machining composites. Students will demonstrate competency by machining previously made parts with specialized tools and CNC machines. Students will complete projects while practicing filament winders, waterjets, and router tables.

Objectives:
• Identify and explain the use of different types of composite tooling.
• Use different techniques to properly run composite CNC machines.
• Practice CNC safety.

Supplemental Courses Varies by Institution

Davis

TECM 1020 Blueprint Reading **1 Credit / 30 Clock-Hours**

This course will cover reading and interpreting engineering drawings and composite blueprints. This course will explore blueprint symbols, views, part orientation related to composite manufacturing and fabrication, and basic Geometric Dimensioning and Tolerancing as a composite technician.

Objectives:
• Explain part tolerance.
• Interpret and describe the technical information provided on industrial prints through drawings, dimensions, and notes.
• Visualize three-dimensional parts from the standard orthographic projections found on prints, and navigate the total manufacturing print, including lines, scale, language, symbols, title blocks, and other components.
• Visualize parts from drawings consisting of multiple views, including basic, auxiliary, partial, and various types of section views.
• Interpret symbols and notes used to communicate special manufacturing requirements that are not directly illustrated and dimensioned.

TECM 1120 Composite Repair and Part Finish Introduction **1 Credit / 30 Clock-Hours**

In this course, students will learn basic composite repair and paint methods. Students will cover repair assessment, types of damage and repair, and replacing damaged composite materials. Students will learn the steps necessary to produce a finished composite part by doing surface preparation, applying body filler, applying primer, and painting their composite part.

Objectives:
• Perform visual inspections as it relates to damage.
• Describe the types and causes of damage.
• Practice removal of damaged material.
• Demonstrate the skills to return a repaired part back to service life.
• Use proper primer and paint applications.

TECM 1140 Advanced Composite Repair and Part Finish — 2 Credits / 60 Clock-Hours

In Advanced Composite Repair and Part Finish, Students in this course will cover repair procedures specific to advanced composites. Students will demonstrate how to repair composite parts similar to those found in the aerospace industry. Students will then demonstrate proper structural repairs on parts previously built in other courses. Students will demonstrate competency in composites part finish by applying acquired skills to paint and finish their repaired parts. .

Objectives:
- Perform visual inspections as it relates to damage on aerospace grade parts.
- Describe the types and causes of damage to advanced composite parts.
- Practice removal of damaged material on advanced composite parts.
- Demonstrate proper repair procedures for core plug repairs and through part repairs.
- Demonstrate the skills to return an advanced repaired part back to service life.
- Practice surface preparation, including sanding, priming, and painting.
- Use proper primer and paint applications.
- Paint multiple composite parts.

TECM 1201 Autoclave and Alternate Processes — 2 Credits / 60 Clock-Hours

Students will learn autoclave operations and other alternative composite fabrication techniques in this course. Students will become familiar with the terminology associated with autoclave operation and develop the skills to program the autoclave to cure high-strength composite parts. Additionally, students will explore various alternative methods of fabricating composite parts utilizing tools, materials, and equipment used throughout the composite industry.

Objectives:
- Describe the limits and possibilities of alternative manufacturing methods.
- Explain the essential operation of an autoclave.
- Identify components of an autoclave.
- Demonstrate the ability to set up and run an autoclave cure.
- Describe several methods using alternative composite processes.
- Produce a resin-infused part.

TECM 1300 Lean Manufacturing — 1 Credit / 30 Clock-Hours

Lean Manufacturing is used in many businesses and industries to minimize waste, reduce accidents, and operate in a more efficient manner. The main objective of Lean Manufacturing is the concept of continuous and incremental improvements to a product or process while eliminating wasteful or redundant activities. When waste can be identified and eliminated, a product can be built with more efficiency and higher quality in less time.

Objectives:
- Discuss methods used in Lean Manufacturing to solve problems. (Fishbone Diagram, 5 Whys)
- Identify the 8 types of waste.
- Demonstrate 5S.
- Explain what value-added work means.
- Discuss “traceability”, quality stamps, and an employee’s role in accurately maintaining record of process and part compliance.

TECM 1400 Introduction to Composite Engineering — 2 Credits / 60 Clock-Hours

Students in this course will fabricate parts from composite materials. Students will do flexural tests of different composite layups. Using collected data, students will design their own layup and test to see the strengths. Students will develop a working set of drawings for a bridge of their own design. Students will then fabricate that design with high strength to weight being the main objective.

Objectives:
• Identify and compare the various physical properties of different composite materials.
• Calculate strength to weight ratios.
• Practice structure design, drawing, and construction with composite materials.
• Demonstrate procedures used in testing composite structures.

TECM 1410 Carbon Fiber Part Skinning — 1 Credit / 30 Clock-Hours

Carbon Skinning- or wrapping - is used only for cosmetic reasons. The beauty of the various weaves of carbon can make an otherwise unnoticed part become a focal point. In this course, the student will learn methods used to skin a part of their choice. Methods discussed will include part preparation, template making, drapability of fabrics, back wetting, building up resin as a finish topcoat, finish sanding methods, and final polishing.

Objectives:
• Identify the materials needed to carbon fiber skin a part.
• Describe additional techniques to manipulate woven carbon fiber material to conform to a 3-dimensional part.
• Explain the wet layup process in detail.
• Describe uses for epoxy resin.
• Demonstrate time management.
• Execute the processes of sanding and polishing resin to a high luster finish.

TECM 1440 Pattern and Mold Construction — 2 Credits / 60 Clock-Hours

Pattern and mold making are essential skills for the Composites Technician who wants to create their own custom parts. Whether as an entrepreneur or employee, the ability to develop custom molds allows for the construction of almost limitless composite configurations. Students in this course will follow the mold-making process from start to finish by practicing pattern manufacturing, gel coat application, fiberglass reinforcing, mold troubleshooting and repair, and finishing and pulling a sample part from the mold.

Objectives:
• Explain the terms describing pattern design.
• Demonstrate simple plug fabrication using your pattern design.
• Demonstrate proper gel coat application.
• Demonstrate proper mold reinforcing.
• Demonstrate simple single and multi-piece mold making techniques.
• Discuss Gel Coat repair and mold finishing.

TECM 1800 Composite Capstone I **1 Credit / 30 Clock-Hours**

This course will build upon prior instruction and experience to meet or exceed industry standards. In collaboration with an instructor, students plan a composite material build, including materials arrangement, blueprint design, and writing a work order to specification and time.

Objectives:
• Develop a personal project in collaboration with instructors.
• Design a blueprint and a work-order for your personal project.
• Develop a cost analysis for your personal project.

TECM 1810 Composite Capstone II **2 Credits / 60 Clock-Hours**

In this course, students will complete their planned project from the previous capstone project. Students will demonstrate their mastery of composite material building and pave the way for successful careers in the composites industry.

Objectives:
• Produce a composite part using your design.
• Solve issues that arise during the lay-up process.
• Document lessons learned during your personal project.
• Meet original design parameters.

TEBP 1100 Digital Literacy **2 Credits / 60 Clock-Hours**

The Digital Literacy course explores current technology. Students will practice appropriately and effectively using tools for productivity and collaboration tools; finding reliable information; creating content; communicating safely; and identifying credibility and bias in modern digital environments.

Objectives:
• Demonstrate digital citizenship and appropriate interpersonal digital information.
• Describe concepts relating to common digital environments, software, hardware, and operating systems.
• Describe digital security threats and explain how to protect personal devices and digital content.
• Use tools and technologies to collaborate.
• Create, edit, and save digital content and manage digital information.
• Navigate the internet and evaluate the integrity of digital information.

TEDR 1225 Production Drafting Basics **2 Credits / 60 Clock-Hours**

The Production Drafting Basics course delves into the practical realm of blueprint reading for manufacturing. Students will learn about industry standards to successfully interpret technical drawings.

Objectives:
• Identify and explain the components of a technical drawing.
• Interpret and analyze information presented on technical drawings.
• Interpret common symbols, abbreviations, and annotations used in technical drawings.
• Apply blueprint reading skills to solve practical problems.
• Use a CAD system as a drafting tool.

WKSK 1400 Workplace Success **2 Credits / 60 Clock-Hours**

Workplace Success is designed to help students develop essential work habits and attitudes as well as human-relation skills needed to maintain gainful and satisfying employment. Topics include common challenges faced in the workplace, such as presenting yourself professionally, developing a professional work ethic, developing interpersonal skills, navigating office politics successfully, and planning and managing your career.

Objectives:
• Demonstrate a positive attitude and set and accomplish personal and career goals.
• Manage time, stress, organization and finances.
• Explain conflict resolution, negotiation and communication in the workplace.
• Display a strong work ethic and illustrate accountability.
• Perform work within a group effectively and discuss the value of negotiation and compromise.
• Describe the basics of public speaking and presenting a professional demeanor.
• Implement career goals and take active control of professional life.

WKSK 1500 Job Seeking Skills **1 Credit / 30 Clock-Hours**

Job Seeking Skills explores how to prepare and successfully apply to potential career opportunities. During this course, you will be presented with essential job-seeking skills needed to find gainful employment.

Objectives:
• Create a professional resume, cover letter and reference sheet.
• Utilize online tools successfully to create an e-portfolio.
• Expand and develop networking skills.
• Utilize online resources effectively to find job openings.
• Demonstrate the ability to fill out job applications in a professional manner.
• Perform successfully in a job interview.
• Demonstrate appropriate follow-up procedures.

Ogden-Weber

TECM 1005 Fundamentals of Composites **2 Credits / 60 Clock-Hours**

This course focuses on both learning the basics and providing the fundamental training in a hands-on environment to provide the needed skills to move into the advanced composite workplace. Areas of focus for the technician are developing composite lay-up skills and composite vacuum bagging training. This course provides simple and clear training for the person seeking the technical skills needed to enter the aerospace, or aircraft, or any industry using advanced composites.

Objectives:
• Identify proper reinforcement fabrics commonly used in industry.
• Define terminology associated with composites.
• Explain the open and closed molding methods, techniques, and procedures.
• Demonstrate proper mixing of epoxy resin with a variety of reinforcement fibers.
• Demonstrate proper material selection per fabrication requirements.
• Perform a tensile test.

TECM 1045 Workplace Relations and Job Seeking Skills for Composites **1 Credit / 30 Clock-Hours**

This course will explore essential workplace soft skills needed to apply, secure, and maintain gainful employment. This course will cover topics on workforce environments and situations; including, but not limited to: problem solving, conflict resolution, workplace ethics, workplace diversity, and professional relationship skills. This course will explore how to successfully complete a job application, create, maintain, and revise a resume and cover letter, and critical interviewing skills.

Objectives:
• Prepare and conduct an effective job search.
• List methods of locating job listings.
• Explain the intricacies of the application process.
• Identify the importance of networking and professional relationships.
• Describe social media's role in networking.
• Identify information needed to complete an employment application and demonstrate handling of salary expectations on an employment application.
• List what you need to consider when providing references.
• Explain the intricacies of resumes and cover letters.
• Prepare a resume and cover letter.
• Describe the importance of making a good first impression.
• Prepare for a job interview.
• Complete a mock interview.
• Explain what to do after an interview and how to properly resign from one's current job.

TECM 1500 NDI Methods for Composites **2 Credits / 60 Clock-Hours**

In this course students will learn an introduction into five NDI Methods that include Penetrant Inspection or Penetrant Testing Magnetic Particle Inspection, or magnetic Particle Testing, Electromagnet Inspection or Electromagnetic Testing, Radiographic inspection or Radiographic Testing and Ultrasonic Inspection or Ultrasonic Testing. The students will get an introduction into how to apply each of these methods to locate surface-breaking defects and sub-surface defects in composite materials as well as other types of materials. These NDI methods are used to detect inherent flaws during manufacturing, in-service flaws on products and final products. Students will use state of the art NDI equipment for hand on experience and demonstration of achieved skill.

Objectives:
• Apply five methods of Non-Destructive Inspection. (NDI)
• Explain the different possible types of defects in a composite structure.
• Demonstrate how to find a flaw in a composite part.

TECM 1600 Composite Tool Making and Vacuum Infusion **2 Credits / 60 Clock-Hours**

This course will explore the advantages and disadvantages of metal and composite tooling and the vacuum infusion process. This course will also cover tooling requirements common to the composites industry. Additionally, this course will explore safe and proper execution of a vacuum infusion process on a given project within the course.

Objectives:
• Identify tooling commonly used in the industry.
• Define terminology associated with tooling.
• Distinguish between the advantages and disadvantages of metal tooling.
• Distinguish between the advantages and disadvantages of composite tooling.
• Explain several molding methods used in the industry.
• Demonstrate proper techniques relating to composite tool making.
• Define terminology associated with the vacuum infusion process.
• Describe the advantages and disadvantages of the vacuum infusion process.
• Demonstrate proper vacuum infusion processes.

TECM 1820 Composite Projects I **1 Credit / 30 Clock-Hours**

This course will explore the planning and execution of complex projects related to composite materials as assigned by the program advisor. Coursework will vary with the work accessible and may be limited to materials and machinery available. This course will provide instructor-led guidance to build upon prior instruction and experience to meet or exceed industry standards as well as practice in professional level work according to industry standards determined by the composites industry.

Objectives:
• Demonstrate proper planning and execution of a complex project.
• Use previous courses and experiences as they pertain to the project.
• Demonstrate proper composite processes.

TECM 1830 Composite Projects II **2 Credits / 60 Clock-Hours**

This course will explore the planning and execution of complex projects related to composite materials as assigned by the program advisor. Coursework will vary with the work accessible and may be limited to materials and machinery available. This course will provide instructor-led guidance to build upon prior instruction and experience to meet or exceed industry standards as well as practice in professional level work according to industry standards determined by the composites industry.

Objectives:
• Demonstrate proper planning and execution of a complex project.
• Use previous courses and experiences as they pertain to the project.
• Demonstrate proper composite processes.

TECM 1900 Utah Aerospace Pathways Work-Based Learning **1 Credit / 45 Clock-Hours**

This course is the internship portion of the training for high school students participating in the Utah Aerospace Pathways program. To receive credit for this course, students must provide proof of satisfactory completion of their internship with an aerospace partner.

Objectives:
• Follow all rules, procedures and policies of the worksite including those related to safety.
• Build on previous education and experiences as they pertain to the job.
• Gain work experience in the composites industry.

TECM 1910 Composite Work-Based Learning I **1 Credit / 45 Clock-Hours**

This course will provide valuable work experience in the composite materials industry while working under the supervision of a qualified industry professional approved by the College.

Objectives:
• Follow all rules, procedures and policies of the worksite including those related to safety.
• Build on previous education and experiences as they pertain to the job.
• Gain work experience in the composites industry.

TECM 1920 Composite Work-Based Learning II **1 Credit / 45 Clock-Hours**

This course will provide valuable work experience in the composite materials industry while working under the supervision of a qualified industry professional approved by the College.

Objectives:
• Follow all rules, procedures and policies of the worksite including those related to safety.
• Build on previous education and experiences as they pertain to the job.
• Gain work experience in the composites industry.

TECM 1930 Composite Work-Based Learning III **1 Credit / 45 Clock-Hours**

This course will provide valuable work experience in the composite materials industry while working under the supervision of a qualified industry professional approved by the College.

Objectives:
• Follow all rules, procedures and policies of the worksite including those related to safety.
• Build on previous education and experiences as they pertain to the job.
• Gain work experience in the composites industry.

TEDR 1200 Parametric Solid Modeling **3 Credits / 90 Clock-Hours**

The Parametric Solid Modeling course explores parametric solid modeling, a process of feature and dimension driven design, for the creation of basic models. Students will learn about model/drawing association, best modeling practices, and industry standards.

Objectives:
- Use commands and modeling strategies to create solid model parts and assemblies.
- Define terminology and processes related to parametric modeling.
- Develop drawings from created models.
- Interpret engineering design intent.
- Identify areas for review and iteration through redlining.

TECM 1050 Tools and Measurements **1 Credit / 30 Clock-Hours**

This course will explore drilling and fastening techniques common to the composites industry. Various precision measurement instruments such as dial calipers, micrometers and other gauges will be utilized to determine proper dimensions of composite materials and parts. Additionally, this course will address the relevant mathematical skills needed to be a composite technician and will introduce the lean manufacturing process.

Objectives:
• Demonstrate proficiency marking and drilling several composite laminates.
• Identify common fastening techniques used in composite manufacturing.
• Compare several measurement devices such as squares, protractors, calipers, micrometers, height gauges, thickness gauges and radius gauges.
• Accurately determine dimensions of various parts.
• Perform unit conversions of weight, length, area, and volume.
• Utilize unit conversions to complete a cost estimate of a given project.
• Define the concepts of lean manufacturing.
• Actively demonstrate safety.

TECM 1020 Blueprint Reading **1 Credit / 30 Clock-Hours**

This course will cover reading and interpreting engineering drawings and composite blueprints. This course will explore blueprint symbols, views, part orientation related to composite manufacturing and fabrication, and basic Geometric Dimensioning and Tolerancing as a composite technician.

Objectives:
• Explain part tolerance.
• Interpret and describe the technical information provided on industrial prints through drawings, dimensions, and notes.
• Visualize three-dimensional parts from the standard orthographic projections found on prints, and navigate the total manufacturing print, including lines, scale, language, symbols, title blocks, and other components.
• Visualize parts from drawings consisting of multiple views, including basic, auxiliary, partial, and various types of section views.
• Interpret symbols and notes used to communicate special manufacturing requirements that are not directly illustrated and dimensioned.

TECM 1105 Composites Automated Cutting and Kitting **1 Credit / 30 Clock-Hours**

This course will explore how to design, edit, nest, and control a CNC cutting machine using various software tools as well as cutting, preventative maintenance and kitting project parts.

Objectives:
• Identify all safety practices and precautions needed to operate an automated cutting table.
• Define terminology associated with designing, cutting and kitting.
• Demonstrate proper material selection per kitting requirements.
• Demonstrate proper record keeping and reporting of prepreg materials.
• Use Patternsmith software.
• Demonstrate proper techniques relating to designing, cutting and kitting.

TECM 1100 Advanced Composite Materials **3 Credits / 90 Clock-Hours**

This course introduces prepreg materials, terminology, storage, handling practices, clean room etiquette, lay-up methods, and manufacturing techniques for creating high-quality prepreg materials. Students develop skills in identifying foreign object debris (FOD) in finished parts and exploring applications for core materials.

Objectives:
• Apply proper prepreg material techniques.
• Identify different types of core materials.
• Describe and perform characteristics of advanced composite materials.
• Describe and perform proper orientation and a balanced lay-up.

TECM 1130 Composite Repair **2 Credits / 60 Clock-Hours**

This course will explore repair methods for basic composite parts, repair assessment, types of damage and repair, replacing damaged composite material, and part reconstruction.

Objectives:
• Identify different types of damages and/or defects.
• Detect different types of damages and/or defects.
• Define terminology associated with composite repair.
• Identify materials used in composite repair.
• Demonstrate proper damage removal, design and repair methods.
• Use application of materials as they pertain to repair processes.
• Demonstrate proper repair processes.

TECM 1135 Composite Repair II **1 Credit / 30 Clock-Hours**

This course will explore advanced repair methods for composite parts, repair assessments, types of damage, proper repair procedures, replacing damaged composite material, and demonstrating part reconstruction. This course is a continuation of Composite Repair I.

Objectives:
• Define the need for regulations and documentation in composite repair.
• Explain the basics of a Cure Cycle Controller and Hot Bonder.
• Detect different types of damages and defects.
• Define terminology associated with composite repair.
• Identify materials used in composite repair.
• Demonstrate proper damage removal, design and repair methods.
• Demonstrate the application of materials as they pertain to repair processes.
• Demonstrate proper repair processes.

TECM 1200 Autoclave Processing **1 Credit / 30 Clock-Hours**

This course will cover the vocabulary and safety practices needed for the essential operation of the autoclave and associated software. Students will keep records and reports for jobs using the autoclave. Students will gain the experience necessary for autoclave operation.

Objectives:
• Run a program on the autoclave.
• Define the functions of an autoclave.
• Describe and identify characteristics of curing advanced composite materials.
• Describe and perform the functions of a curing system.
• Properly use and maintain thermocouples.

TECM 1215 Composite Filament Winding **1 Credit / 30 Clock-Hours**

This course will explore common vocabulary, materials, and safety practices related to filament winding. Additionally, this course will explore ways to create parts from different mandrels and pressure vessels while practicing record keeping and reporting of jobs.

Objectives:
• Identify all safety practices and precautions needed to operate a filament winder.
• Explain the basic operation of a filament winder.
• Demonstrate proper record keeping and reporting of the jobs.
• Demonstrate a safe and successful operation of the filament winder.

TECM 1550 Composite Machining Basics **1 Credit / 30 Clock-Hours**

This course will introduce aspects of machining composite materials, cover terminology associated with machining composites and the use of machining parts with specialized tools through the utilization of a waterjet cutting machine.

Objectives:
• Define the machining process.
• Identify different classifications of tools.
• List common machining operations.
• List the advantages of manual, automatic, and CNC controlled machine tools.
• Identify common features on a CNC controller.
• Identify different classifications of machining personnel and manufacturing facility layouts.
• Describe composite-specific concerns as they relate to machining.
• Actively demonstrate proper safety, preparation, lay-up, curing and machining of composite materials.

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TECM 1020 Blueprint Reading **1 Credit / 30 Clock-Hours**

This course will cover reading and interpreting engineering drawings and composite blueprints. This course will explore blueprint symbols, views, part orientation related to composite manufacturing and fabrication, and basic Geometric Dimensioning and Tolerancing as a composite technician.

Objectives:
• Explain part tolerance.
• Interpret and describe the technical information provided on industrial prints through drawings, dimensions, and notes.
• Visualize three-dimensional parts from the standard orthographic projections found on prints, and navigate the total manufacturing print, including lines, scale, language, symbols, title blocks, and other components.
• Visualize parts from drawings consisting of multiple views, including basic, auxiliary, partial, and various types of section views.
• Interpret symbols and notes used to communicate special manufacturing requirements that are not directly illustrated and dimensioned.

TECM 1040 Workplace Success **1 Credit / 30 Clock-Hours**

Workplace Success is an introductory course that provides students with the essential tools to be successful in today's workplace environment. Students will also develop soft skills that apply to real work environments, including communication, writing, planning and organizing, and time management.

Objectives:
• Demonstrate effective workplace communication.
• Analyze issues, make sound decisions, and overcome problems.
• Demonstrate time management skills in the workplace.
• Work effectively and respectfully with others.

TECM 1200 Autoclave Processing **1 Credit / 30 Clock-Hours**

This course will cover the vocabulary and safety practices needed for the essential operation of the autoclave and associated software. Students will keep records and reports for jobs using the autoclave. Students will gain the experience necessary for autoclave operation.

Objectives:
• Run a program on the autoclave.
• Define the functions of an autoclave.
• Describe and identify characteristics of curing advanced composite materials.
• Describe and perform the functions of a curing system.
• Properly use and maintain thermocouples.

TECM 1210 Filament Winding **2 Credits / 60 Clock-Hours**

In the Filament Winding course, students will be introduced to the foundational topics of advanced filament winding in composites. Students will be introduced to safety, creating a wind, generating motion, chain/transition wind, viewing, and editing motion.

Objectives:
• Recognize and describe safety requirements and health hazards related to composite filament winding.
• Generate fiber path, helical, circumferential, bottle, and nonlinear fiber paths using carbon fiber, fiberglass, and resin systems.
• Chain/transition winds using segment flags.
• Describe and define materials used in advanced filament winding.

TECM 1220 Quality Assurance **2 Credits / 60 Clock-Hours**

The Quality Assurance course will introduce students to the quality inspection of manufacturing. After completion of this course, students will understand how to inspect a product and compare it to engineered blueprints to determine quality.

Objectives:
• Demonstrate the basic underlying principles of quality inspection.
• Use hand tools, computer-assisted measurements, and other modern-day inspection methods.
• Demonstrate quality inspection procedures to real-world applications.
• Explain the basics of the CMM.

TECM 1230 Metrology **1 Credit / 30 Clock-Hours**

Metrology covers introductory topics in basic metrology. Students will be introduced to the fundamental skills and the uses of calipers, micrometers, height gages, scales, and tape measures.

Objectives:
• Demonstrate the proper use of metrology equipment.
• Describe and use calipers and micrometers.
• Describe and use scales and height gages.
• Describe and use a tape measure properly.