



ENGINEERING CAREER CLUSTER DESIGN

Aviation Production Pathway

CIP CODE 15.0000

APPROVED PATHWAY:

- Includes a minimum of three secondary-level credits.
- Includes a work-based element.
- Consist of a sequence:
 - Introductory-level course.
 - Technical-level course.
 - Application-level course.
- Supporting documentation includes:
 - Articulation Agreement(s).
 - Certification.
 - Program Improvement Plan.
 - Program of Study.
- Technical-level and Application-level courses receive .5 state weighted funding in an approved CTE pathway.

INTRODUCTORY LEVEL

| Title | Code | Credit |
|---------------------------------------|-------|--------|
| Production Blueprint Reading | 21108 | 0.5 |
| Introduction to Industrial Technology | 38001 | 0.5 |

TECHNICAL LEVEL

| Title | Code | Credit |
|-------------------------|-------|--------|
| * Hand and Power Tools | 40400 | 0.5 |
| * Aviation Fundamentals | 40410 | 0.5 |
| Aviation Systems | 40420 | 1 |

DESIGN STRAND

| Title | Code | Credit |
|--------------|-------|--------|
| Drafting/CAD | 21107 | 1 |

PRODUCTION STRAND

| Title | Code | Credit |
|-------------------|-------|--------|
| Mass Production I | 13052 | 1 |

APPLICATION LEVEL

DESIGN STRAND

| Title | Code | Credit |
|---|-------|--------|
| Workplace Experience | 21048 | 1 |
| Workplace Experience in Engineering | 41048 | 0.5 |
| # Part Design | 41500 | 0.5 |
| Assembly Design | 41505 | 0.5 |
| Wireframe and Surfaces | 41510 | 0.5 |
| Aerospace Drawings | 41515 | 0.5 |
| # Special Projects and Research in Aviation | 41520 | 1 |

PRODUCTION STRAND

| Title | Code | Credit |
|-------------------------------------|-------|--------|
| Tooling I | 40600 | 1 |
| # Tooling II | 40610 | 1 |
| Aerostructures I | 40620 | 1 |
| # Aerostructures II | 40630 | 1 |
| Composites I | 40640 | 1 |
| # Composites II | 40650 | 1 |
| Workplace Experience in Engineering | 41048 | 0.5 |
| Workplace Experience | 21048 | 1 |

* Required courses for pathway approval.

Has prerequisite course(s):

Courses comprising a sequence are numbered consecutively. See Competency Profile for details. Drafting/CAD (21107) is a prerequisite for Part Design (41500).

Part Design (41500), Assembly Design (41505), Wireframe and Surfaces (41510), and Aerospace Drawings (41515) are prerequisites for Special Projects and Research in Aviation (41520).

KANSAS STATE CAREER CLUSTER COMPETENCY PROFILE

ENERGY PATHWAY (C.I.P. 17.2071)

STUDENT _____

Rating Scale:

- 3 - Proficient Achievement
- 2 - Limited Achievement
- 1 - Inadequate Achievement
- 0 - No Exposure

ENGINEERING CLUSTER

Graduation Date _____
I certify that the student has received training in the areas indicated.

Instructor Signature _____

Instructor Signature _____

Instructor Signature _____

Instructor Signature _____

COMMON CAREER TECHNICAL CORE – CAREER READY STANDARDS

(To be taught in all courses in the approved pathway)

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

COMMON CAREER TECHNICAL CORE – STEM CLUSTER STANDARDS (To be taught in all courses in the approved pathway)

1. Apply engineering skills in a project that requires project management, process control and quality assurance.
2. Use technology to acquire, manipulate, analyze and report data.
3. Describe and follow safety, health and environmental standards related to science, technology, engineering and mathematics (STEM) workplaces.
4. Understand the nature and scope of the Science, Technology, Engineering & Mathematics Career Cluster and the role of STEM in society and the economy.
5. Demonstrate an understanding of the breadth of career opportunities and means to those opportunities in each of the Science, Technology, and Engineering & Mathematics Career Pathways.
6. Demonstrate technical skills needed in a chosen STEM field.

INTRODUCTORY LEVEL COURSES

38001-INTRODUCTION TO INDUSTRIAL TECHNOLOGY (.5 Credit) An introductory level course designed to instruct students in the basic skills necessary to all occupations in the Construction, Manufacturing & Transportation areas.

4 3 2 1 0 1. Basic Safety

- Identify causes of accidents and the impact of accident costs.
- Follow safe behavior procedures on and around ladders, scaffolds and stairs.
- Follow safe behavior procedures around electrical hazards.
- Demonstrate the use, care and inspection of appropriate personal protective equipment (PPE)
- Explain the importance of hazard communications (HazCom) and material

safety data sheets (MSDSs).

-Respond to hazardous-materials and hazardous-waste emergency situations in accordance with regulatory requirements.

- Follow safety procedures required for lifting heavy objects.

-Demonstrate a working knowledge of safety education, environment, and enforcement for life and work.

- Apply safe practices while using tools and equipment.

-Apply safe practices for housekeeping, dress, fire, chemicals & personal protection while working in a shop.

-Describe fire prevention and firefighting techniques.

-Explain the purpose of OSHA and how it promotes safety on the job.

4 3 2 1 0 2. **Industrial Math**

-Add, subtract, multiply, and divide whole numbers, fractions, decimals and percentages.

-Use a standard ruler, a metric ruler, and a measuring tape to measure.

-Demonstrate conversion skills for decimals and fractions.

-Recognize and perform calculations using metric units of length, weight, volume and temperature.

4 3 2 1 0 3. **Hand Tools**

-Recognize and identify some of the basic hand tools and their proper uses in industrial trades.

-Demonstrate the safe use of common hand tools.

4 3 2 1 0 4. **Power Tools**

-Recognize and identify some of the basic power tools and their proper uses in the industrial trades.

-Demonstrate the safe use of common power tools.

-Perform preventive maintenance on basic power tools used in the industrial trades.

4 3 2 1 0 5. **Blueprint Reading**

-Perform the drafting principles needed to draw the basic geometric shapes.

-Develop a pictorial sketch of an object.

-Develop a multi-view drawing.

-Identify basic symbols used in blueprints.

-Identify various types of blueprint views used in Architecture, Construction, Manufacturing and Engineering.

4 3 2 1 0 6. **Communication Skills**

-Interpret information and follow instructions presented in both verbal and written form.

-Communicate effectively in on-the-job situations using verbal and written skills in various delivery modes (face-to-face, paper, & electronic).

-Create and complete various written documents used in industrial trades.

-Demonstrate knowledge and use of computer systems and word processing software in effective communication.

4 3 2 1 0 7. **Employability Skills**

-Create and utilize employment documents including a resume and portfolio.

-Demonstrate job seeking and interview skills.

-Understand and respond to performance reviews.

4 3 2 1 0 8. **21st Century/Foundation Skills**

-Demonstrate critical thinking skills and the ability to solve problems using those skills.

-Define effective relationship skills.

-Demonstrate a working knowledge of workplace issues such as sexual

harassment, stress, and substance abuse.

-Demonstrate the ability to achieve common goals through team work

4 3 2 1 0 8. **Materials Handling**

-Verify that health, safety, environmental and government regulations are met.

-Recognize hazards and follow safety procedures required for materials handling.

-Demonstrate ability to load and unload materials properly and safely.

21108 - PRODUCTION BLUEPRINT

READING (.5 Credit) An introductory level course to provide students with the knowledge and ability to interpret the lines, symbols, and conventions of blueprints from a variety of industrial applications.

4 3 2 1 0 1. Identify symbols associated with blueprints

4 3 2 1 0 2. Interpret work from multiview drawings

4 3 2 1 0 3. Interpret size and location of features

4 3 2 1 0 4. Visualizing shapes and objects in multiple views

4 3 2 1 0 5. Ability to convert fractions and decimals proficiently

4 3 2 1 0 6. Interpret inch and metric drawings

4 3 2 1 0 7. Demonstrate legend and note reading skills

4 3 2 1 0 8. Interpret basic geometric dimensioning and tolerancing terminology

4 3 2 1 0 9. Identify different views utilized in blueprint reading

4 3 2 1 0 10. Identify orthographic projection such as lines and symbols for electrical, piping, mechanical, architectural, welding, and machining prints

TECHNICAL LEVEL COURSES

40400 – Hand & Power Tools (.5 credit)

Provides technical knowledge used in Aviation and Manufacturing area related to hand and power tools.

- 3 2 1 0 1. Apply basic concepts and terminology to precision instruments
- 3 2 1 0 2. Utilize precision instruments
- 3 2 1 0 3. Demonstrate safety procedures used with portable and stationary electrical equipment used in manufacturing
- 3 2 1 0 4. Utilize portable and stationary electrical equipment used in manufacturing
- 3 2 1 0 5. Explain procedures for using the correct electrical tools based on project specifications
- 3 2 1 0 6. Describe and understand how to drill, deburr and chamfer quality holes.
- 3 2 1 0 7. Describe and understand the use of power and pneumatic hand tools used in manufacturing
- 3 2 1 0 8. Demonstrate how to safely use power and pneumatic hand tools used in manufacturing.
- 3 2 1 0 9. Identify drilling and countersinking techniques used in manufacturing
- 3 2 1 0 10. Identify fasteners used in the manufacturing industry

40410 – Aviation Fundamentals (.5

credit) ***Course Required for Pathway Approval.** An Introduction to Aviation fundamentals related to materials, processes, and history of Aviation.

- 3 2 1 0 1. Describe the history and future
- 3 2 1 0 2. Identify and discuss primary assemblies/structures and their functions

- 3 2 1 0 3. Describe the principles of flight
- 3 2 1 0 4. Interpret how the mechanical systems and the design of an airplane impact flight characteristics
- 3 2 1 0 5. Identify and discuss airplanes based on their configuration
- 3 2 1 0 6. Describe and discuss the types of materials used on an airplane
- 3 2 1 0 7. Identify the methods of airplane construction
- 3 2 1 0 8. Compare and contrast aviation manufacturing processes
- 3 2 1 0 9. Identify and describe the impact of corrosion on airplane
- 3 2 1 0 10. Interpret the purpose and importance of regulation in the aviation industry
- 3 2 1 0 11. Discuss the usage of statistical process control in relationship to quality concepts in the aerospace industry.
- 3 2 1 0 12. Discuss and describe the history of the quality movement in manufacturing
- 3 2 1 0 13. Employ basic lean manufacturing concepts for the aerospace industry

40420 – Aviation Systems (1 credit)

Provides students with an in-depth knowledge of the major systems and components of an Aircraft.

- 3 2 1 0 1. Describe the history and future of aviation
- 3 2 1 0 2. Identify and discuss primary assemblies/structures and their functions
- 3 2 1 0 3. Describe the principles of flight
- 3 2 1 0 4. Interpret how the mechanical systems and the design of an airplane impact flight characteristics
- 3 2 1 0 5. Identify and discuss airplane based on their configuration
- 3 2 1 0 6. Describe and discuss the types of materials used on an airplane
- 3 2 1 0 7. Identify the methods of airplane construction

- 3 2 1 0 8. Calculate the manufacturing cost concepts as they relate to aviation
- 3 2 1 0 9. Describe the manufacturing systems management and control
- 3 2 1 0 10. Identify and discuss manufacturing processes and technologies control
- 3 2 1 0 11. Identify producibility concepts in aviation manufacturing
- 3 2 1 0 12. Describe and discuss electrical systems in aircraft and their functions
- 3 2 1 0 13. Explain and interpret avionics systems in aircraft and their functions
- 3 2 1 0 14. Describe and discuss flight control system in aircraft and their functions
- 3 2 1 0 15. Describe environmental control systems in aircraft and their functions
- 3 2 1 0 16. Analyze door systems in aircraft and their functions
- 3 2 1 0 17. Compare hydraulic and pneumatic systems in aircraft and their functions
- 3 2 1 0 19. Identify mechanical components in aircraft and their functions
- 3 2 1 0 20. Explain landing gear systems in aircraft and their functions
- 3 2 1 0 21. Describe and discuss windows systems in aircraft and their functions
- 3 2 1 0 22. Describe the various fuel systems in aircraft and their functions
- 3 2 1 0 23. Illustrate propulsion systems in aircraft and their functions
- 3 2 1 0 24. Compare and contrast Anti - Ice and De-ice systems in aircraft and their functions

21107 – DRAFTING/CAD (1 Credit)

A comprehensive, technical level course designed to instruct students in the use of CAD design and software.

- 3 2 1 0 1. Identify and demonstrate the use of CAD commands and system peripherals.
- 3 2 1 0 2. Demonstrate the ability to dimension

- drawings on the CAD system.
- 3 2 1 0 3. Demonstrate proficiency in setting limits and scale on the CAD system.
 - 3 2 1 0 4. Demonstrate proficiency in setting, turning on and turning off layers.
 - 3 2 1 0 5. Create standard drawings for templates.
 - 3 2 1 0 6. Demonstrate the ability to load, store files, and transport files via Internet.
 - 3 2 1 0 7. Place text on a drawing and be able to change to different font styles, sizes and angles.
 - 3 2 1 0 8. Be proficient in the use of printer/plotter operations.
 - 3 2 1 0 9. Demonstrate ability to place text on a drawing and change to different font styles, sizes and angles.
 - 3 2 1 0 10. Demonstrate ability to dimension drawings on the CAD system.
 - 3 2 1 0 11. Demonstrate proficiency in setting limits and scale on the CAD system.
 - 3 2 1 0 12. Construct drawings using straight line, circle, and hidden line statements, etc.
 - 3 2 1 0 13. Construct isometric and 3D drawings.
 - 3 2 1 0 14. Set grid and snap specifications.
 - 3 2 1 0 15. Define and use commands to modify a drawing.
 - 3 2 1 0 16. Use symbols (from a symbol library) in a drawing.

13052- MASS PRODUCTION (1 Credit) A comprehensive, technical level course designed to instruct students in the knowledge and skills required for fabricating products using a variety of materials (wood, plastic, metal, composites).

- 3 2 1 0 1. Identify materials and processes incorporated in mass production
- 3 2 1 0 2. Utilize technical drawings/blueprints, work orders, and other ways of conveying product specifications
- 3 2 1 0 3. Apply math skills to manage distance,

- spacing, angle measurements, and placement for project development
- 3 2 1 0 4. Perform steps to interpret, transfer and layout procedures for projects
- 3 2 1 0 5. Estimate production costs based on product needs assessment
- 3 2 1 0 6. Safely use and maintain basic hand and power tools
- 3 2 1 0 7. Demonstrate skills required to safely use power equipment
- 3 2 1 0 8. Explore and/or implement computer automations into mass production
- 3 2 1 0 9. Analyze and solve problems using skills related to methods in production of a product
- 3 2 1 0 10. Integrate mass production processes into design as related to traditional methods of manufacturing and constructing products
- 3 2 1 0 11. Select and perform best practices for joining, assembling, and finishing projects
- 3 2 1 0 12. Incorporate LEAN manufacturing concepts pertaining to mass production _ visual management, _ value stream mapping, _ 5S, _ kanban systems, _ lean metrics, _ shop layout
- 3 2 1 0 13. Explain the role of business and market in the free enterprise system
- 3 2 1 0 14. Research future technologies affecting mass production and teaming concepts related to going green, recycling supplies, alternative resources

APPLICATION LEVEL COURSES

DESIGN STRAND

41500 – Part Design (.5 credit) Teach the

Part Design process through creation of solid parts without complex contours.

Demonstrate basic concepts of the part structure

- 3210 1. Navigate the “product life” data management system
- 3210 2. Identify the part design tools
- 3210 3. Identify the part sketching tools
- 3210 4. Manipulate components within the environment
- 3210 5. Manage documents: search, open, close, save, and delete

Demonstrate how to effectively use the part sketching tools to create sketches

- 3210 6. Create parameters and sketches
- 3210 7. Constrain parameters sketches
- 3210 8. Modify parameters and sketches

Demonstrate how to effectively use the part design tools

- 3210 9. Create solid objects: pads, pockets, shafts, grooves, holes, ribs, and slots
- 3210 10. Create fillets, chamfers, and drafts
- 3210 11. Create patterns, perform transformations and splits
- 3210 12. Modify parts using parameters
- 3210 13. Work with multiple bodies and perform Boolean operations
- 3210 14. Integrate surfaces in the creation of solid objects
- 3210 15. Apply materials to parts

41505 – Assembly Design (.5 credit)

Teach Assembly Design through the use of advanced assembly and navigation tools.

Create projects that utilize the components of assembly design

- 3 2 1 0 1. Identify the Assembly Design Workbench
- 3 2 1 0 2. Manipulate components in an assembly
- 3 2 1 0 3. Constrain components in an assembly
- 3 2 1 0 4. Modify components in an assembly
- 3 2 1 0 5. Insert components in an assembly

- 3 2 1 0 6. Work with the links of the assembly
- 3 2 1 0 7. Create parts within the assembly structure
- 3 2 1 0 8. Create scenes and annotated views

Demonstrate how to effectively measure and analyze concepts using digital mock up analysis tools

- 3 2 1 0 9. Identify the digital mock up tools
- 3 2 1 0 10. Perform measurements
- 3 2 1 0 11. Perform analyses including clash and section
- 3 2 1 0 12. Capture pictures and create xml files for external use

Demonstrate how to effectively utilize the digital mock up tools

- 3 2 1 0 13. Identify the digital mock up tools
- 3 2 1 0 14. Manipulate components in an assembly
- 3 2 1 0 15. Constrain components in an assembly
- 3 2 1 0 16. Modify components in an assembly
- 3 2 1 0 17. Insert components in an assembly
- 3 2 1 0 18. Work with the links of the assembly
- 3 2 1 0 19. Create parts within the assembly structure

Demonstrate how to effectively manipulate navigation tools in assembly design and digital mock up analysis tools

- 3 2 1 0 20. Utilize all of the navigation tools

41510 – Wireframe & Surfaces (.5

credit) Teach students Wireframe & Surfaces design geometry used to create complex contours.

Demonstrate basic concepts of the wireframe and surface structure

- 3 2 1 0 1. Navigate the “product life”
- 3 2 1 0 2. Identify the wireframe and surface tools
- 3 2 1 0 3. Review integration of wireframe and surface geometry to create solid objects
- 3 2 1 0 4. Identify how wireframe and surface geometry is used throughout the environment

Demonstrate how to effectively create wireframe

geometry with the wireframe and surface tools

- 3 2 1 0 5. Create points, lines, and planes
- 3 2 1 0 6. Create circles and corners
- 3 2 1 0 7. Create curves: splines, helixes, parallels, combines, projects, and intersects
- 3 2 1 0 8. Work with 2D and 3D supports
- 3 2 1 0 9. Modify wireframe geometry

Demonstrate how to effectively create surfaces with the wireframe and surface tools

- 3 2 1 0 10. Create basic surfaces: extrudes, revolves, spheres, cylinders
- 3 2 1 0 11. Create offset surfaces
- 3 2 1 0 12. Create swept surfaces
- 3 2 1 0 13. Create fill surfaces
- 3 2 1 0 14. Create multi-section and blend surfaces
- 3 2 1 0 15. Work with geometrical laws

Demonstrate how to effectively perform operations on geometry with the wireframe and surface tools

- 3 2 1 0 16. Perform joins on wireframe and surfaces
- 3 2 1 0 17. Perform heals on surfaces and smooth wireframe
- 3 2 1 0 18. Perform splits, trims, and extracts on wireframe and surfaces
- 3 2 1 0 19. Create fillets and chamfers on surfaces
- 3 2 1 0 20. Create patterns, perform transformations and extrapolations on wireframe and surfaces

Demonstrate how to effectively perform analysis on geometry with the wireframe and surface tools

- 3 2 1 0 21. Perform connect checker analysis on wireframe and surfaces
- 3 2 1 0 22. Perform draft and curvature analysis on surfaces
- 3 2 1 0 23. Perform porcupine curvature analysis on wireframe

41515 – Aerospace Drawings (.5 credit)

Teach Technical Illustration techniques used to create technical drawings for Aviation.

Demonstrate basic concepts of the drafting structure

- 3 2 1 0 1. Navigate the project life data management system
 - 3 2 1 0 2. Identify the drafting tools
 - 3 2 1 0 3. Review drafting standards and basic drafting concepts
 - 3 2 1 0 4. Create a drawing and a new sheet
- Demonstrate how to effectively create views and dimensions for a drawing in a CAD system**
- 3 2 1 0 5. Create views from parts
 - 3 2 1 0 6. Modify sheets and views
 - 3 2 1 0 7. Create dimensions
 - 3 2 1 0 8. Apply GD&T to a drawing
 - 3 2 1 0 9. Modify dimensions
- Demonstrate how to effectively create annotations and markups for a drawing in a CAD system**
- 3 2 1 0 10. Create annotations and symbols
 - 3 2 1 0 11. Modify annotations and symbols
 - 3 2 1 0 12. Create markups
 - 3 2 1 0 13. Create fill areas
- Demonstrate how to effectively work with assemblies in a CAD system**
- 3 2 1 0 14. Create views from assemblies
 - 3 2 1 0 15. Create balloons and bills of material
 - 3 2 1 0 16. Manipulate views with cut, copy, and paste
 - 3 2 1 0 17. Create views of parts from an assembly
 - 3 2 1 0 18. Work with links in an assembly drawing
- Demonstrate how to effectively create 2D geometry with a CAD system**
- 3 2 1 0 19. Create 2D views manually
 - 3 2 1 0 20. Create 2D geometry using drawing tools
 - 3 2 1 0 21. Create, modify and use 2D components
 - 3 2 1 0 22. Create, modify, and use title blocks

41048 Workplace Experience in

Engineering (.5 credit) Application level workplace experience /internship completed by students at a business location or within the school that is an engineering occupational experience.

- 3 2 1 0 1. Employ effective listening skills when working with client.

- 3 2 1 0 2. Employ customer service principles when working with consumers.
- 3 2 1 0 3. Evaluate and follow-up on customer service provided.
- 3 2 1 0 4. Employ safety skills and equipment usage in appropriate ways.
- 3 2 1 0 5. Be aware of MSDS (Material Safety Data Sheets) and other safety resources and employ those resources as required for the workplace.

21048 Workplace Experience (1 credit)

Application level workplace experience /internship completed by students at a business location or within the school that is an engineering occupational experience.

- 3 2 1 0 1. Employ effective listening skills when working with client.
- 3 2 1 0 2. Employ customer service principles when working with consumers.
- 3 2 1 0 3. Evaluate and follow-up on customer service provided.
- 3 2 1 0 4. Employ safety skills and equipment usage in appropriate ways.
- 3 2 1 0 5. Be aware of MSDS (Material Safety Data Sheets) and other safety resources and employ those resources as required for the workplace.

441520 – Special Projects and

Research in Aviation (1 credit) An advanced level production design course that incorporates advanced techniques of aviation design with additional software packages specific to the production and application of aviation parts and systems. (Must be preceded by all Aviation Design Strand Application courses, except for Workplace Experience)

- 3 2 1 0 1. Define scope of work (or area to be researched) and appropriately document the

- process
- 3 2 1 0 2. Discuss the manufacturing methods and materials in current production process drawings
- 3 2 1 0 3. Identify proper process for design of new parts
- 3 2 1 0 4. Compare and contrast the impact of the parts on various aviation systems
- 3 2 1 0 5. Describe the material options and their properties
- 3 2 1 0 6. Utilize advanced techniques to design and develop aircraft parts
- 3 2 1 0 7. Apply 2D and 3D design to assemble aviation parts
- 3 2 1 0 8. Demonstrate in-depth knowledge on the selected topic
- 3 2 1 0 9. Manipulate the parts to show the functions
- 3 2 1 0 10. Apply basic principles of form and function to meet project parameters and specifications
- 3 2 1 0 11. Demonstrate knowledge of the key functions and subsystems of the product
- 3 2 1 0 12. Evaluate the final project

PRODUCTION STRAND

40600 – Tooling I (1 credit) Students learn to utilize tools and processes in Aviation tool assembly.

- 4 3 2 1 0 1. Apply all shop safety standards – breaking sharp edges, eye/hearing protection, unplug air hose when changing drill bits/rivet sets
- 4 3 2 1 0 2. Identify and define Foreign Object Damage (FOD) and the impact on finished product
- 4 3 2 1 0 3. Utilize industry specific tools and materials in aerospace manufacturing

- 4 3 2 1 0 4. Understand the use of blueprints and picture sheets used in the aerospace manufacturing.
- 4 3 2 1 0 5. Utilize precision measuring instruments
- 4 3 2 1 0 6. Identify and explain the different types of tooling used in aerospace and/or advanced manufacturing
- 4 3 2 1 0 7. Demonstrate how to safely use hand tools used in aerospace and/or advanced manufacturing tooling
- 4 3 2 1 0 8. Demonstrate how to safely use power tools used in aerospace and/or advanced manufacturing tooling
- 4 3 2 1 0 9. Describe the need for creating tools in the aerospace and/or advanced manufacturing industry
- 4 3 2 1 0 10. Understand the role of the toolmaker
- 4 3 2 1 0 11. Read and interpret the requirements on an engineering drawing
- 4 3 2 1 0 12. Practice General Welding Safety
- 4 3 2 1 0 13. Cut metal using Power Equipment
- 4 3 2 1 0 14. Demonstrate basic knowledge of GMAW and GTAW welding techniques
- 4 3 2 1 0 15. Perform skills associated with hand drilling operations
- 4 3 2 1 0 16. Demonstrate skills associated with hand drill operations
- 4 3 2 1 0 17. Apply skills associated with precision drilling operations
- 4 3 2 1 0 18. Demonstrate skills associated with drill press operations
- 4 3 2 1 0 19. Demonstrate the ability to precision to holes to specified tolerances
- 4 3 2 1 0 20. Define the basic principles of Geometric Dimensioning & Tolerancing (GD&T)
- 4 3 2 1 0 21. Identify GD&T symbols
- 4 3 2 1 0 22. Interpret form and orientation tolerances
- 4 3 2 1 0 23. Interpret profile, runout and location tolerances

40610 – Tooling II (1 credit) Teach skills necessary to create and produce Aviation fixtures and jigs

- 3 2 1 0 1. Identify the critical features the tooling process
- 3 2 1 0 2. Identify the role of performance assemblies
- 3 2 1 0 3. Demonstrate how to safely perform tap and die process in aerospace and/or advanced manufacturing tooling
- 3 2 1 0 4. Describe the final details in the tooling process
- 3 2 1 0 5. Describe proper layout for installation
- 3 2 1 0 6. Practice tool building skills by creating Drill Fixture
- 3 2 1 0 7. Create a permanent assembly with proper hardware
- 3 2 1 0 8. Demonstrate skills associated with hand drill and drill press operations
- 3 2 1 0 9. Map out the assembly project based on project specifications
- 3 2 1 0 10. Select and edge utilizing GD &T principles
- 3 2 1 0 11. Perform Hole generation processes
- 3 2 1 0 12. Layout final assembly project based on project specifications
- 3 2 1 0 13. Create final assembly project based on project specifications
- 3 2 1 0 14. Perform final inspection of assembly project
- 3 2 1 0 15. Demonstrate skills associated with removable sub assembly

40620 – Aerostructures I (1 credit) An application level course designed to teach students a general overview of assembly techniques used in Aviation.

- 3 2 1 0 1. Demonstrate how to safely use hand tools used in aerospace manufacturing.
- 3 2 1 0 2. Identify and define Foreign Object Damage (FOD) and the impact on finished product

- 3 2 1 0 3. Apply all shop safety standards – breaking sharp edges, eye/hearing protection, unplug air hose when changing drill bits/rivet sets
- 3 2 1 0 4. Utilize industry specific tools and aerospace specific materials
- 3 2 1 0 5. Understand the use of blueprints and picture sheets used in the aerospace manufacturing.
- 3 2 1 0 6. Utilize precision measuring instruments
- 3 2 1 0 7. Identify and select fasteners used in aviation industry based on engineering drawings
- 3 2 1 0 8. Identify most common materials used in aircraft manufacturing such as sheet metal
- 3 2 1 0 9. Demonstrate layout techniques for sheet metal
- 3 2 1 0 10. Apply layout techniques to industry specific project within tolerance of +/- .03"
- 3 2 1 0 11. Calculate parts (angle, nutplates, fasteners) locations based on engineering drawings
- 3 2 1 0 12. Demonstrate net trim skills
- 3 2 1 0 13. Demonstrate temporary assembly techniques
- 3 2 1 0 14. Demonstrate drilling techniques
- 3 2 1 0 15. Identify correct drill bit and motor
- 3 2 1 0 16. Perform drilling a perpendicular hole
- 3 2 1 0 17. Demonstrate de-burring techniques
- 3 2 1 0 18. Practice proper fastener removal
- 3 2 1 0 19. Identify and select rivets, sets, and retainer spring based on engineering drawing
- 3 2 1 0 20. Demonstrate effective conventional rivet and blind fastener installation
- 3 2 1 0 21. Install counter sunk rivet
- 3 2 1 0 22. Describe and discuss the elements of assembly in terms of quality and inspection

- 3 2 1 0 23. Utilize techniques used in application of non-conforming aspects
- 3 2 1 0 24. Describe proper demonstration of documentation of FAA guidelines and related costing features

40630 – Aerostructures II (1 credit)

An application level course designed to teach students to master the techniques associated with aerospace mechanical assembly.

- 3210 1. Describe the hazards and PPE associated with sealants
- 3210 2. Identify the appropriate sealant for each project
- 3210 3. Demonstrate the basic concepts associate with aerospace sealant processes
- 3210 4. Identify guidelines for proper application of sealant including issues of surface temperature, sealant expiration, and sealant consistency
- 3210 5. Install and properly seal a direct ground stud installation
- 3210 6. Understand principles and application of torque
- 3210 7. Install and remove close to tolerance specialty fasteners
- 3210 8. Demonstrate special techniques for drilling and countersinking on a curved surface
- 3210 9. Practice fastener installation on a curved surface
- 3210 10. Produce close tolerance holes in composite materials and materials harder than aluminum
- 3210 11. Employ techniques used in fastener removal and installation
- 3210 12. Demonstrate various types of patch repairs
- 3210 13. Perform teamwork skills to Layout and produce project
- 3210 14. Conduct Team Bucking Skills
- 3210 15. Install stringers and hat sections

- 3210 16. Describe and discuss the elements of assembly in terms of quality and inspection
- 3210 17. Utilize techniques used in application of non-conforming aspects
- 3210 18. Describe proper demonstration of documentation of FAA guidelines and related costing features

40640 – Composites I (1 credit) An application level course designed to teach students the fundamentals of Composite Theory Materials Equipment & Processes.

- 3 2 1 0 1. Apply safety standards associated with aviation composite industry
- 3 2 1 0 2. Understand the use of blueprints, picture sheets, and ply tables/maps used in aerospace and/or advanced manufacturing
- 3 2 1 0 3. Apply quality controls to the lab environment: appropriate documentation, material control concepts, and lean concepts
- 3 2 1 0 4. State the terminology commonly found in the composites industry.
- 3 2 1 0 5. Identify the materials- their properties and roles- commonly found in the composites industry.
- 3 2 1 0 6. Compare the tools and equipment commonly found in the composites industry.
- 3 2 1 0 7. Identify the role of documentation in the lay up process
- 3 2 1 0 8. Identify the roles of the tools/ materials commonly used in preparation for the layup process : tool/mold, release agent, tacky tape
- 3 2 1 0 9. Describe and discuss the process commonly associated with the aviation and/or advanced manufacturing composite industry
- 3 2 1 0 10. Demonstrate the proper processes commonly associated with the aviation and/or advanced manufacturing composite industry

- 3 2 1 0 11. Identify the concepts associated with material/fiber orientation
- 3 2 1 0 12. Practice layup skills associated with core pre preg materials
- 3 2 1 0 13. Practice layup skills associated with pre preg materials
- 3 2 1 0 14. Practice layup skills associated with wet layup
- 3 2 1 0 15. Employ appropriate handling of composite part techniques
- 3 2 1 0 16. Apply appropriate net trim techniques.
- 3 2 1 0 17. Perform surface preparation
- 3 2 1 0 18. Apply composite fabrication concepts to industry based projects
- 3 2 1 0 19. Define techniques and requirements in composite inspection

40650 – Composites II (1 credit) An application level course designed to teach students Composite, Assembly, & Repair.

- 3 2 1 0 1. Apply safety standards associated with the aviation and/or advanced manufacturing composite industry
- 3 2 1 0 2. Understand the use of blueprints and picture sheets used in aerospace and/or advanced manufacturing.
- 3 2 1 0 3. Utilize the planning paper/engineering drawing to determine type of makeup of part materials (Kevlar, fiberglass, carbon fiber, or hybrid)
- 3 2 1 0 4. Perform layout techniques
- 3 2 1 0 5. Demonstrate correct methods for drilling holes
- 3 2 1 0 6. Identify fastener types – inserts, threaded fasteners
- 3 2 1 0 7. Apply co-bonding/co- curing process
- 3 2 1 0 8. Demonstrate countersinking with composites
- 3 2 1 0 9. Employ a non-structural secondary bonding techniques

- 3 2 1 0 10. Recommend procedures for quality assurance inspection
- 3 2 1 0 11. Demonstrate structural secondary bonding techniques
- 3 2 1 0 12. Apply composite fabrication skills and techniques to industry-based projects.
- 3 2 1 0 13. Describe the inspection process in composite repair
- 3 2 1 0 14. Perform basic NDI skills
- 3 2 1 0 15. Apply industry standards to damage assessment
- 3 2 1 0 16. Demonstrate structural repairs using both wet layup and pre-preg materials
- 3 2 1 0 17. Employ composite documentation skills
- 3 2 1 0 18. Utilize disassembly techniques in the composite repair problem
- 3 2 1 0 19. Practice damage removal procedures in the composite repair process
- 3 2 1 0 20. Perform core removal and replacement procedures in the repair process
- 3 2 1 0 21. Describe laser layout and ply locating in composite fabrication
- 3 2 1 0 22. Describe automated fiber placement in composite fabrication

41048 Workplace Experience in Engineering (.5 credit) Application level

- workplace experience /internship completed by students at a business location or within the school that is an engineering occupational experience.
- 3 2 1 0 1. Employ effective listening skills when working with client.
 - 3 2 1 0 2. Employ customer service principles when working with consumers.
 - 3 2 1 0 3. Evaluate and follow-up on customer service provided.
 - 3 2 1 0 4. Employ safety skills and equipment usage in appropriate ways.
 - 3 2 1 0 5. Be aware of MSDS (Material Safety Data Sheets) and other safety resources and

employ those resources as required for the workplace.

21048 Workplace Experience (1 credit)

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