

APPROVED PATHWAY:

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



TRANSPORTATION CAREER CLUSTER DESIGN

Aviation Maintenance Pathway

CIP CODE 47.0608

INTRODUCTORY LEVEL

Title	Code	Credit
Introduction to Industrial Technology	38001	.5 credit

Title	Code	Credit
Production Blueprint Reading	21108	.5 credit

TECHNICAL LEVEL

Title	Code	Credit
*Hand and Power Tools	40400	.5 credit
*Aviation Fundamentals	40410	.5 credit
Aviation Systems	40420	1 credit

Avionics Strand

Title	Code	Credit
Foundations of Electronics	21201	1 credit

Engine Maintenance Strand

Title	Code	Credit
Foundations of Electronics	21201	1 credit
Aviation Engine Basics	40430	1 credit

APPLICATION LEVEL

Avionics Strand

Title	Code	Credit
AC Electronics	40450	.5 credit
DC Electronics	40460	.5 credit
Microcontrollers	40470	1 credit
Integrated Circuits	40480	1 credit
Drones	40490	1 credit
Digital Electronics	21008	1 credit
Workplace Experience in Engineering	41048	.5 credit
Workplace Experience	21048	1 credit

Engine Maintenance Strand

Title	Code	Credit
Aviation Engine Performance I	40500	1 credit
Aviation Engine Performance II	40510	1 credit
Aviation Material Processes	40520	1 credit
Aviation Pneumatics and Hydraulics	40530	1 credit
Workplace Experience in Engineering	41048	.5 credit
Workplace Experience	21048	1 credit

* Courses required for Pathway approval.

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 timeline of aviation history
- 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 timeline of aviation history
- 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. Describe and discuss 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 and discuss environmental control systems in aircraft and their functions
- 3 2 1 0 16. Describe and discuss door systems in aircraft and their functions
- 3 2 1 0 17. Describe and discuss hydraulic systems in aircraft and their functions
- 3 2 1 0 18. Describe and discuss pneumatic systems in aircraft and their functions
- 3 2 1 0 19. Describe and discuss mechanical components in aircraft and their functions
- 3 2 1 0 20. Describe and discuss 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 and discuss fuel systems in aircraft and their functions
- 3 2 1 0 23. Describe and discuss propulsion systems in aircraft and their functions
- 3 2 1 0 24. Describe and discuss Anti - Ice and De-ice systems in aircraft and their functions

21201 Foundations of Electronics (1 credit)

Lab Practices

- 3210 1. Apply proper OSHA safety standards
- 3210 2. Demonstrate acceptable soldering and desoldering techniques.

Demonstrate Proficiency in DC Circuits

- 3210 3. Relate, identify, and apply Ohm's law to voltage, current, resistance, power, and energy.
- 3210 4. Read and interpret color codes and symbols to identify electrical components and values.
- 3210 5. Measure properties of a circuit using DMM meters, oscilloscopes, and power supplies.
- 3210 6. Compute, measure, apply, construct, and verify Ohm's law to operation of series circuits.
- 3210 7. Compute, measure, apply, construct, and verify Ohm's law to operation of parallel circuits.
- 3210 8. Compute, measure, apply, construct, and verify Ohm's law to operation of series-parallel circuits.
- 3210 9. Identify, define, construct, verify, and troubleshoot loaded and unloaded voltage divider circuits.
- 3210 10. Apply, construct, and verify the operation of DC circuits that demonstrate the maximum power transfer theory.
- 3210 11. Define magnetic properties of circuits and devices.
- 3210 12. Determine, define, identify, and troubleshoot RC and RL time constant circuits.
- 3210 13. Define basic motor theory and operation.

Demonstrate Proficiency in AC Circuits

- 3210 14. Identify, analyze, and measure AC signals.
- 3210 15. Define, construct, verify, and troubleshoot AC capacitive circuits.
- 3210 16. Define, construct, verify, and troubleshoot AC inductive circuits.
- 3210 17. Construct, verify, and troubleshoot AC circuits utilizing transformers.
- 3210 18. Define, construct, and verify series and parallel resonant circuits.
- 3210 19. Define, construct, verify, and troubleshoot

filter circuits.

- 3210 20. Set up and operate DVMs, power supplies, oscilloscopes, and frequency counters for AC circuits.

40430 – Aviation Engine Basics (1 Credit)

(Engine Maintenance Strand only) A comprehensive, technical level course designed to instruct students in the principles and concepts related to basic engine operation.

- 3 2 1 0 1. Identify the parts of a cylinder and of a crankshaft
- 3 2 1 0 2. Identify and inspect various types of bearings.
- 3 2 1 0 3. Remove and replace a stud
- 3 2 1 0 4. Install piston and/or knuckle pin(s).
- 3 2 1 0 5. Install cylinder assembly on an engine.
- 3 2 1 0 6. Illustrate reciprocating engine theory of operation.
- 3 2 1 0 7. Describe basic radial engine design and components
- 3 2 1 0 8. Demonstrate Firing order of a reciprocating engine
- 3 2 1 0 9. Analyze probable cause and removal of a hydraulic lock.
- 3 2 1 0 10. Describe Valve adjustment on a radial engine.
- 3 2 1 0 11. Compare and contrast the purpose of master and articulating rods
- 3 2 1 0 12. Identify various components installed on an engine.
- 3 2 1 0 13. Verify proper operation of a reciprocating engine
- 3 2 1 0 14. Identify Induction system leak indications.
- 3 2 1 0 15. Utilize reciprocating engine maintenance procedures
- 3 2 1 0 16. Identify Procedures for inspecting various engine components during an overhaul.
- 3 2 1 0 17. Ensure correct installation of piston rings

- 3 2 1 0 18. Diagram the purpose/function/operation of various reciprocating engine components
- 3 2 1 0 19. Summarize Inspection requirements for an engine fuel system.
- 3 2 1 0 20. Complete checks of fuel systems to verify proper operation.
- 3 2 1 0 21. Troubleshoot an engine fuel system.
- 3 2 1 0 22. Analyze the Procedure for inspection of an engine driven fuel pump for leaks and security.
- 3 2 1 0 23. Operate one or more types of fuel pumps
- 3 2 1 0 24. Operate one or more types of fuel valves.
- 3 2 1 0 25. Identify components of an engine fuel system.
- 3 2 1 0 26. Remove and/or install an engine-driven fuel pump.
- 3 2 1 0 27. Inspect a main fuel filter assembly for leaks.
- 3 2 1 0 28. Inspect fuel boost pumps for correct pressure.
- 3 2 1 0 29. Remove and/or install a fuel boost pump.
- 3 2 1 0 30. Inspect engine fuel system fluid lines and/or components.
- 3 2 1 0 31. Remove, clean, and/or replace an engine fuel strainer.
- 3 2 1 0 32. Illustrate meaning of prefixes such as micro, mega, kilo, and milli as used in expressing electrical quantities.
- 3 2 1 0 33. Compare differences between straight mineral oil, ashless dispersant oil, and synthetic oil.
- 3 2 1 0 34. Differentiate between types of oil used for different climates.
- 3 2 1 0 35. Describe the functions of an engine oil.
- 3 2 1 0 36. Identify proper lubricants.
- 3 2 1 0 37. Explain the servicing of the lubrication system.

APPLICATION LEVEL COURSES

AVIONICS STRAND

40450 – AC Electronics (.5 credit) Teach the fundamental concepts of Alternating Current.

- 3 2 1 0 1. Apply and relate Ohm's Law
- 3 2 1 0 2. Read and interpret load balancing and symbols for AC systems
- 3 2 1 0 3. Identify properties of an AC signal
- 3 2 1 0 4. Define peak, peak-to-peak, average, and RMS voltage and current.
- 3 2 1 0 5. Define resistance, receptance, and impedance
- 3 2 1 0 6. Define RMS power, apparent power, true power, and reactive power
- 3 2 1 0 7. Analyze and measure AC signals using oscilloscope, frequency meter, and generator
- 3 2 1 0 8. Define the characteristics of AC alternators, single-phase, and three-phase motors
- 3 2 1 0 9. Construct and Verify the operation of AC capacitive Circuits
- 3 2 1 0 10. Construct and Verify the operation of AC Inductive Circuits
- 3 2 1 0 11. Construct and Verify the Operation of AC circuits using Transformers
- 3 2 1 0 12. Construct and Verify the operation of Passive Filter Circuits
- 3 2 1 0 13. Troubleshoot differentiator and integrator circuits

40460 – DC Electronics (.5 credit) Teach) Teach the fundamental concepts of Direct Current.

- 3 2 1 0 1. Define voltage, current, resistance, power, and energy
- 3 2 1 0 2. Apply and relate Ohm's Law
- 3 2 1 0 3. Read and interpret color codes and

symbols to identify resistive electrical components and values.

- 3 2 1 0 4. Measure electrical properties of a circuit using a digital multimeter circuit
- 3 2 1 0 5. Computer and measure conductance and resistance of conductors and insulators
- 3 2 1 9 6. Construct and Verify Series Circuits
- 3 2 1 0 7. Construct and Verify Parallel Circuits
- 3 2 1 0 8. Construct and Verify Series Parallel Circuits
- 3 2 1 0 9. Construct and Verify Voltage Divider Circuits
- 3 2 1 0 10. Set up and Utilize power supplies, oscilloscopes, ammeter, ohmmeter, and voltmeter
- 3 2 1 0 11. Apply maximum power transfer theory
- 3 2 1 0 12. Troubleshoot various circuit failures

40470 – Microcontrollers (1 credit) Teach the fundamental concepts of Microprocessing and controllers.

- 3 2 1 0 1. List the components of an embedded microcontroller-bases system.
- 3 2 1 0 2. Explain the difference between a microcontroller, microprocessor, microcontroller unit and microprocessor unit.
- 3 2 1 0 3. Draw the block diagram of a microcontroller-based system showing the microprocessor, memory, I/Os and buses.
- 3 2 1 0 4. Describe the functions of the access bus, data bus, and control signals.
- 3 2 1 0 5. Explain the difference between machine language, assembly language and high-level computer languages.
- 3 2 1 0 6. Explain the purpose of registers and their function in the programming model for a microcontroller.
- 3 2 1 0 7. Explain the use of the data condition flags
- 3 2 1 0 8. Explain the functional categories of a microcontroller instruction set.

- 3 2 1 0 9. Explain how data memory (registers) are divided into banks and how registers are accessed.
- 3 2 1 0 10. Demonstrate ability to construct a flowchart to specify the tasks to be performed and their sequence
- 3 2 1 0 11. Describe the functions of various programs such as an editor, assembler, linker, and debugger used in developing assemble language software
- 3 2 1 0 12. Write and execute a simple assembly language program.
- 3 2 1 0 13. Demonstrate the debugging techniques in troubleshooting assembly language programs
- 3 2 1 0 14. Explain the concepts of memory pointers and indexing.
- 3 2 1 0 15. Explain how data is copied between the program memory and data registers
- 3 2 1 0 16. Explain the function of arithmetic instructions add, subtract, increments, decrement, 1's and 2's complement, and compare how flags are affected
- 3 2 1 0 17. Write a set of instruction to illustrate the use of data copy and arithmetic instructions.
- 3 2 1 0 18. Demonstrate the following debugging techniques in troubleshooting assembly language programs: single-step, breakpoint, and tracing code.
- 3 2 1 0 19. Explain how flags are used in making programming decisions and setting up loops
- 3 2 1 0 20. Calculate the time needed for a MPU to execute instructions in a loop and write instruction to generate time delays
- 3 2 1 0 21. Explain logic instructions and their operations
- 3 2 1 0 22. Illustrate the format of multiple instructions and explain their operations
- 3 2 1 0 23. Define the terms stack and stack pointer and explain how they are used.
- 3 2 1 0 24. Explain the functions of the instructions PUSH and POP.

- 3 2 1 0 25. Define the terms subroutine and macro, and list advantages and disadvantages of each.
- 3 2 1 0 26. Explain the basic concepts in I/O interfacing using a block diagram.
- 3 2 1 0 27. Explain how binary addresses are assigned to I/O ports, data bus, and control signals.
- 3 2 1 0 28. Explain the term “multiplexed I/O ports”.
- 3 2 1 0 29. Interface switches, push button keys, and a matrix keyboard to a microcontroller and write instruction to read and process key inputs.

40480 – Integrated Circuits (1 credit)

Teach the fundamental concepts of Integrated Circuits and Circuit Design.

- 3 2 1 0 1. Describe what is meant by the term operational amplifier
- 3 2 1 0 2. Explain the finite limits of operational amplifiers
- 3 2 1 0 3. Describe what is meant by an internally-compensated operational amplifier
- 3 2 1 0 4. Describe in terms of 3-dB frequency, finite gain, slope, unity gain, and gain bandwidth product the open and closed loop frequency response of the compensated operational amplifier
- 3 2 1 0 5. Describe under what conditions positive feedback will cause instability in operational amplifier designs
- 3 2 1 0 6. Demonstrate the use of the operational amplifier as an analog comparator
- 3 2 1 0 7. Describe the use of comparators in flash analog-to-digital (ADC) converters
- 3 2 1 0 8. Demonstrate the use of the operational amplifier as a voltage buffer or unity gain amplifier
- 3 2 1 0 9. Calculate gain coefficients for input terms for the inverting and non-inverting summing

amplifier

- 3 2 1 0 10. Calculate the trigger voltages for the non-inverting comparator used as a Schmitt trigger
- 3 2 1 0 11. Describe what meant by a first-order, second order, and higher order filters
- 3 2 1 0 12. Calculate the gain and 3-dB frequency utilizing a variety of filters
- 3 2 1 0 13. Describe the theory of operation of the RC phase shift oscillator
- 3 2 1 0 14. Explain the conditions required for unstable oscillations in RC phase shift feedback oscillators in terms of phase shift and gain
- 3 2 1 0 15. Calculate the expected frequency of oscillation for different operations amplifier and/ or emitter oscillators
- 3 2 1 0 16. Describe the theory of operation of the LC tuned circuit oscillator
- 3 2 1 0 17. Explain the conditions required for unstable oscillations in tuned circuit oscillators in terms of Q, gain and phase
- 3 2 1 0 18. Describe the theory of operation of the relaxation oscillator
- 3 2 1 0 19. Explain the conditions required for unstable oscillations in relaxation oscillators in terms of rate of discharge, delay, and time constant
- 3 2 1 0 20. Describe the theory of operation of the 555 timer integrated circuit
- 3 2 1 0 21. Calculate the duty cycle and oscillation frequency of the 555 timer integrated circuit
- 3 2 1 0 22. Calculate the pulse width of the 555 timer integrated circuit in the one shot mode of operation
- 3 2 1 0 23. Explain what is meant by voltage regulation of a voltage regulator
- 3 2 1 0 24. Explain what is meant by line and load regulation of a voltage regulator
- 3 2 1 0 25. Explain what is meant by a shunt, series, and shunt-series voltage regulator

40490 – Drones (1 credit) Teach the principles,

- practices, and regulation of sUAS operations
- 3 2 1 0 1. Describe the applicability of 14 CFR part 107 to small unmanned aircraft operations.
 - 3 2 1 0 2. Demonstrate Knowledge of UAS Regulations
 - 3 2 1 0 3. Demonstrate Knowledge of Airspace Classification and Operating Requirements
 - 3 2 1 0 4. Demonstrate Knowledge of Weather as it relates to sUAS
 - 3 2 1 0 5. Demonstrate Knowledge of Loading and Performance as it relates to sUAS
 - 3 2 1 0 6. Demonstrate Knowledge of Operations
 - 3 2 1 0 7. Prepare for written sUAS exam
 - 3 2 1 0 8. Operate sUAS in compliance will all safety concerns
 - 3 2 1 0 9. Recognize the types of airports, such as towered, uncontrolled towered, heliport, and seaplane bases.
 - 3 2 1 0 10. Ensuring the remote pilot can monitor and interpret ATC communications to improve situational awareness.
 - 3 2 1 0 11. Interpret runway markings and signage
 - 3 2 1 0 12. Distinguish traffic patterns used by manned aircraft pilots.
 - 3 2 1 0 13. Identify security Identification Display Areas (SIDA).
 - 3 2 1 0 14. Interpret Aeronautical charts
 - 3 2 1 0 15. Interpret aeronautical chart supplements
 - 3 2 1 0 16. Explain hazardous sUAS operation
 - 3 2 1 0 17. Demonstrate Accident reporting procedures
 - 3 2 1 0 18. Compare and contrast registration regulations for sUAS vs other aircraft
 - 3 2 1 0 19. Describe regulatory deviation an reporting requirements for in flight emergencies
 - 3 2 1 0 20. Explain Visual line of sight (VLOS) aircraft operations.
 - 3 2 1 0 21. Relate aircraft right away guidelines
 - 3 2 1 0 22. Determine if sUAS operation is allowed in a geographical location

- 3 2 1 0 23. Classify operating limitations of sUASs
- 3 2 1 0 24. Calculate loading requirements for different configurations
- 3 2 1 0 25. Predict the performance of sUAS utilizing data
- 3 2 1 0 26. Write to the physiology consideration and their effects on safety
- 3 2 1 0 27. Develop a preflight checklist
- 3 2 1 0 28. Complete preflight inspection
- 3 2 1 0 29. Describe techniques to mitigate mechanical failures
- 3 2 1 0 30. Demonstrate appropriate record keeping.
- 3 2 1 0 31. Compare different types of avionics systems and components from a variety of manufacturers
- 3 2 1 0 32. Discuss the data/information systems such as ARINC and GOGO used in avionics
- 3 2 1 0 33. Examine the communications systems used in avionics

21008 Digital Electronics (1 credit)

Teach students the fundamental concepts and terminology used in Digital Electronics.

- 3210 1. Students will identify hazards in the lab and locations of the MSDS, safety equipment, and resources.
- 3210 2. Students will understand how to prevent dangers from electric shock, including environmental concerns and precautionary measures.
- 3210 3. Students will define and explain direct and alternating currents along with components and schematics used in electronics circuitry.
- 3210 4. Students will correctly calculate and set up lab equipment for safety, design, test, using Ohm's law and circuit measurements.
- 3210 5. Students will identify and differentiate digital and analog waveforms.
- 3210 6. Students will build and test a free running

- clock and calculate output frequencies from observations on an oscilloscope.
- 3210 7. Students will design and build logic circuits derived from Boolean expressions and truth tables.
- 3210 8. Students will use DE Morgan's Theorem, Karnaugh mapping, NOR, NAND, and combinational logic solutions to reduce and simplify circuits.
- 3210 9. Students will design, code, and build logic circuits to control different kinds of displays.
- 3210 10. Students will control the flow of data by utilizing multiplexers and demultiplexers.
- 3210 11. Students will design and implement logic circuits using programmable logic devices that define combinational circuit designs using logic compiler software.
- 3210 12. Students will compare and contrast operation of RS flip-flops, D flip-flops, and J-K flip-flops.
- 3210 13. Students will understand, design, and implement different circuits using synchronous, asynchronous, triggering, and timing using flip-flops.
- 3210 14. Students will design modification counters using timing from asynchronous flip-flops.
- 3210 15. Students will conduct experiments with shift registers for memory storage and arithmetic circuits.
- 3210 16. Students will design both half and full adders from logic circuits to do simple addition and subtraction using binary numbers.
- 3210 17. Students will appropriately select, size, and implement interface devices to control external devices.
- 3210 18. Students will design and create programming to control the position of stepper motors and control speed and torque of servo motors.
- 3210 19. Students will be able to formulate a flow chart to correctly apply basic programming concepts in the planning of a project.

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.

ENGINE MAINTENANCE STRAND

40500–Aviation Engine Performance I

(1 credit) Application level course designed to teach fundamentals of reciprocal operation systems related to aviation engines.

- 3 2 1 0 1. Describe the basic operating principle of d.c. electrical instruments.
- 3 2 1 0 2. Demonstrate basic operating principles of a galvanometer.
- 3 2 1 0 3. Connect voltmeters and ammeters into an electrical circuit.
- 3 2 1 0 4. Describe purpose of a shunt resistor when used with an ammeter.
- 3 2 1 0 5. Explain the reasons for changing engine lubricating oil at specified intervals.
- 3 2 1 0 6. Discover purpose and operation of an oil/air separator.
- 3 2 1 0 7. Examine for excessive internal oil consumption in a reciprocating engine.
- 3 2 1 0 8. Determine the correct oil for specific engine types
- 3 2 1 0 9. Determine approved oils for different climatic temperatures.
- 3 2 1 0 10. Inspect oil cooler and/or oil lines for leaks
- 3 2 1 0 11. Inspect an oil filter or screen
- 3 2 1 0 12. Check engine oil pressure.
- 3 2 1 0 13. Perform oil pressure adjustment.
- 3 2 1 0 14. Identify oil system components.
- 3 2 1 0 15. Replace oil system components
- 3 2 1 0 16. Identify oil system flow.
- 3 2 1 0 17. Service an oil tank.
- 3 2 1 0 18. Perform an engine pre-oil operation.
- 3 2 1 0 19. Troubleshoot an engine oil pressure malfunction.
- 3 2 1 0 20. Troubleshoot an engine oil temperature system.
- 3 2 1 0 21. Troubleshoot a fuel flow and/or low fuel pressure indicating system.
- 3 2 1 0 22. Identify operation of a fuel flow indicating

system

- 3 2 1 0 23. Interpret operation of a temperature indicating system
- 3 2 1 0 24. Interpret operation of a pressure indicating system.
- 3 2 1 0 25. Explain operation of a revolutions per minute (RPM) indicating system.
- 3 2 1 0 26. Complete required checks to verify proper operation of a temperature indicating system.
- 3 2 1 0 27. Complete required checks to verify proper operation of a pressure indicating system
- 3 2 1 0 28. Complete required checks to verify proper operation of a RPM indicating system.
- 3 2 1 0 29. Verify operation of a manifold pressure gauge
- 3 2 1 0 30. Adjust fuel pump fuel pressure.
- 3 2 1 0 31. Troubleshoot abnormal fuel pressure.
- 3 2 1 0 32. Remove, inspect, and/or install a fuel-flow transmitter and/or flow gauge.
- 43 2 1 0 33. Inspect fuel flow transmitter power supply.
- 3 2 1 0 34. Troubleshoot a fuel-flow system
- 3 2 1 0 35. Inspect tachometer markings for accuracy.
- 3 2 1 0 36. Perform resistance measurements of thermocouple indication system.
- 3 2 1 0 37. Compare ignition systems and functions

40510 – Aviation Engine Performance

II (1 credit) Application level course designed to teach fundamentals of diagnostic procedures and practices common to Aviation engine performance.

- 3 2 1 0 1. Disassemble a reciprocating engine
- 3 2 1 0 2. Inspect internal engine components
- 3 2 1 0 3. Reassemble reciprocating engine
- 3 2 1 0 4. Replace packing seals in a push rod housing.
- 3 2 1 0 5. Check and/or rig cable and push-pull

engine controls.

- 3 2 1 0 6. Adjust valve clearances.
- 3 2 1 0 7. Inspect engine mounts.
- 3 2 1 0 8. Demonstrate engine starting procedures.
- 3 2 1 0 9. Perform a cold cylinder check.
- 3 2 1 0 10. Locate top dead-center position of a piston.
- 3 2 1 0 11. Check cylinder compression with differential compression tester.
- 3 2 1 0 12. Analyze symptoms of improper fuel mixture
- 3 2 1 0 13. Identify procedures for checking idle mixture on a reciprocating engine.
- 3 2 1 0 14. Determine possible causes for poor engine acceleration, engine backfiring or missing when the throttle is advanced.
- 3 2 1 0 15. Define types and operation of various fuel metering systems.
- 3 2 1 0 16. Illustrate fuel metering system components.
- 3 2 1 0 17. Identify carburetor components.
- 3 2 1 0 18. Interpret diagram showing fuel and air flow through float-type and/or pressure type carburetor.
- 3 2 1 0 19. Remove and/or install a main metering jet in a carburetor.
- 3 2 1 0 20. Clean and service a carburetor fuel inlet screen.
- 3 2 1 0 21. Identify carburetor air-bleed system.
- 3 2 1 0 22. Remove and/or install the accelerating pump in a float-type carburetor.
- 3 2 1 0 23. Inspect the float level on a float-type carburetor.
- 3 2 1 0 24. Remove and/or install the mixture control system in a float-type carburetor.
- 3 2 1 0 25. Inspect float needle and/or seat in a float-type carburetor.
- 3 2 1 0 26. Identify, remove, and/or install a float-type carburetor.
- 3 2 1 0 27. Adjust idle speed and/or air fuel mixture.
- 3 2 1 0 28. Operate an aircraft engine or an analogues engine

3 2 1 0 29. Troubleshoot engine start-up issues

40520 – Aviation Material Processes

(1 credit) An application level course designed to teach students skills and materials required for manufacturing, assembly, and repair of aircraft.

- 3 2 1 0 1. Identify types of materials used in aviation
- 3 2 1 0 2. Inspect, test, and repair fiberglass, plastics, honeycomb, composite, and laminated primary and secondary structures.
- 3 2 1 0 3. Select, install, and remove special fasteners for metallic, bonded, and composite structures.
- 3 2 1 0 4. Inspect sheet metal structures
- 3 2 1 0 5. Repair sheet metal structures
- 3 2 1 0 6. Install conventional rivets
- 3 2 1 0 7. Install blind fasteners
- 3 2 1 0 8. Perform Layout for Sheetmetal
- 3 2 1 0 9. Manipulate Sheetmetal for aviation structure
- 3 2 1 0 10. Create a project utilizing aviation sheetmetal techniques
- 3 2 1 0 11. Demonstrate the difference between power, work and force
- 3 2 1 0 12. Identify sealing materials as chemicals
- 3 2 1 0 13. Define a physical hazard in relation to work with chemicals
- 3 2 1 0 14. Identify safety data sheet (SDS)
- 3 2 1 0 15. Explain potential physical hazards associated with chemicals
- 3 2 1 0 16. Describe health hazards associated with chemicals
- 3 2 1 0 17. Identify the concept of chemical exposure
- 3 2 1 0 18. Identify PPE used to minimize exposure to chemicals
- 3 2 1 0 19. Describe the federal agency charged with regulating safety
- 3 2 1 0 20. Explain why proper fit of personal protective equipment is important
- 3 2 1 0 21. Demonstrate proper use of personal protective equipment

40530 – Aviation Pneumatics and Hydraulics

(1 credit) An application level course designed to teach students the basic theory and technical knowledge required to service pneumatic and hydraulic systems.

- 3210 1. Identify correct fittings for flexible hose assemblies.
- 3210 2. Identify correct fittings for rigid tubing installations.
- 3210 3. Compare and contrast flare angles for AN, AC, and automotive fittings.
- 3210 4. Demonstrate the process of making appropriate (single or double) flares in rigid tubing using appropriate technical data.
- 3210 5. Identify tubing for low pressure, medium pressure, and high pressure applications.
- 3210 6. Identify flexible hoses used in low pressure, medium pressure, high pressure, and extremely high pressure applications.
- 3210 7. Identify aircraft nuts, bolts, screws, and washers used in aviation
- 3210 8. Identify AN, NAS, and MS specifications
- 3210 9. Differentiate between the types of Hydraulic oils
- 3210 10. Compare and Contrast Hydraulic and Pneumatic systems
- 3210 11. Build, inspect, operate, and troubleshoot a pneumatic system
- 3210 12. Build, inspect, operate, and troubleshoot a hydraulic system
- 3210 13. Demonstrate Bernoulli's Principle
- 3210 14. Apply the principles of physics as they relate to Powerplant operation and components
- 3210 15. Apply the principles of physics as they relate to Airframe structures and components

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.