



8545

AIRCRAFT COMPONENTS AND
FUNCTIONS (11A)

30S/30E/30M

An Aviation and Aerospace Technologies Course

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Course Description

Aircraft Components and Functions is intended for students considering specialization in aviation and aerospace technologies. Curriculum content focuses on fabrication of metallic and non-metallic structures and reciprocating engines. Topics include theory of flight and aerodynamics.

Cross-curricular learning outcomes, or essential skills from subject areas including, but not limited to, information and communication technologies, science, English language arts, and mathematics, are to be integrated into the authentic learning activities of the course.

The curriculum is not sequential. For instructional purposes, the sequence of learning outcomes can vary based on the learning activities within the course.

Goal 1: Describe and apply appropriate **health and safety** practices for aerospace technologies.

GLO 1.1: Describe and apply appropriate **health and safety** practices for aerospace technologies.

No applicable SLOs.

Goal 2: Demonstrate comprehension of the **principles of flight**, as they apply to aviation and aerospace technologies.

GLO 2.1: Demonstrate an understanding of **aerodynamics, control, and stability** in **fixed-** and **rotary-wing** aircraft.

- SLO 11A.2.1.1 Compare and contrast the various rotor designs associated with rotary-wing aircraft.
- SLO 11A.2.1.2 Explain the forces that act on the rotor.
- SLO 11A.2.1.3 Compare and contrast the aerodynamic terminology related to fixed- and rotary-wing aircraft.
- SLO 11A.2.1.4 Define the terms associated with rotary-wing aircraft flight (e.g., *autorotation, ground resonance, stability*).
- SLO 11A.2.1.5 Describe and explain the functions of rotary-wing controls.

Goal 3: Demonstrate an understanding of the **major components of an aircraft** and their **functions**.

GLO 3.1: Demonstrate an understanding of the **major components of an aircraft** and their **functions**.

- SLO 11A.3.1.1 Describe the five major components of a fixed-wing aircraft.
- SLO 11A.3.1.2 Describe how control surfaces of fixed-wing aircraft function aerodynamically, including stall strips, wing fences, vortex generators, flaps, slats, spoilers, ailerons, stabilators, elevators, rudders, and trim tabs.
- SLO 11A.3.1.3 Describe the functions of the components that comprise the airframe structural members of fixed-wing aircraft.
- SLO 11A.3.1.4 Identify the major components of a rotary-wing aircraft's airframe.
- SLO 11A.3.1.5 Explain the functions of the major components of rotary-wing aircraft.
- SLO 11A.3.1.6 Compare and contrast the operation of aerodynamic factors in the flight of airplanes and/or helicopters.

Goal 4: Demonstrate comprehension of **aircraft systems**.

GLO 4.1: Describe **aircraft systems** and their purposes.

- SLO 11A.4.1.1 Describe flight control systems and activation methods for the following:
- cable control systems
 - pushrod control systems
 - hydraulic-assisted systems
 - artificial feel systems

Goal 5: Demonstrate the safe and appropriate **operation of equipment and tools**.

GLO 5.1: Describe the safe and appropriate **management of equipment and tools**.

No applicable SLOs.

GLO 5.2: Demonstrate the **operation of tools and equipment** to fabricate **metallic** parts and projects.

No applicable SLOs.

GLO 5.3: Demonstrate the **operation** of **tools and equipment** to fabricate **non-metallic** parts and projects.

No applicable SLOs.

Goal 6: Demonstrate comprehension of the properties and applications of various **materials and consumables** used in the aviation and aerospace industry.

GLO 6.1: Explain the **properties** of various **materials and consumables** used in the aviation and aerospace industry.

SLO 11A.6.1.1 Identify and classify common metallic and non-metallic materials.

GLO 6.2: Describe **applications** of the various aerospace **materials and consumables**.

SLO 11A.6.2.1 Describe which materials are used in the various aircraft structures and components.

SLO 11A.6.2.2 List the applications of composite materials in aircraft fabrication.

SLO 11A.6.2.3 Describe types of composite construction.

Goal 7: Fabricate parts and components for use in the aviation and aerospace industry.

GLO 7.1: Fabricate **metallic** parts.

No applicable SLOs.

GLO 7.2: Fabricate **non-metallic** parts.

No applicable SLOs.

GLO 7.3: Fabricate **electrical/electronic** components.

No applicable SLOs.

Goal 8: Describe and demonstrate the transferable **cross-curricular skills** as they pertain to **aviation and aerospace technologies**.

GLO 8.1: Read, interpret, and communicate information relevant to aviation and aerospace technologies.

SLO 11A.8.1.1 Describe the purpose of and identify the information in the aircraft maintenance, overhaul, structural repair, service, and component manuals.

- SLO 11A.8.1.2 Demonstrate how to access information in an aircraft illustrated parts catalogue to determine correct part numbers when replacing components within an installed system.
- SLO 11A.8.1.3 Demonstrate the use of a typical aircraft maintenance or overhaul manual to locate information on components repair or overhaul procedures.
- SLO 11A.8.1.4 Identify technical information using the Air Transport Association Specification 100 (ATA Spec 100) numbering system.
- SLO 11A.8.1.5 Use technical language and terms appropriately in context.
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GLO 8.2: Acquire and organize information using **information and communication technology**.

- SLO 11A.8.2.1 Acquire, analyze, and apply specialized information and skills from various disciplines in a variety of realistic circumstances.
- SLO 11A.8.2.2 Support and enhance basic information requirements by using a wide variety of resources (e.g., print, online, community).
- SLO 11A.8.2.3 Apply an appropriate combination of digital, graphic, oral, and written techniques to effectively communicate a technical idea.
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GLO 8.3: Apply **mathematical** knowledge and skills related to aviation and aerospace technologies.

- SLO 11A.8.3.1 Use fractions, decimals, ratios, and percentages.
- SLO 11A.8.3.2 Convert from imperial to metric measurements.
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GLO 8.4: Apply **scientific** knowledge and skills related to aviation and aerospace technologies.

- SLO 11A.8.4.1 Describe the characteristics of matter, including, but not limited to, atomic structure, states of matter, weight, mass, and density.
- SLO 11A.8.4.2 Describe Newton's laws of motion in relation to aircraft components and functions.
- SLO 11A.8.4.3 Identify any parts or systems of an aircraft and/or engine where Bernoulli's principle and/or Newtonian law is applied.
- SLO 11A.8.4.4 Explain the relationship between fluid density and specific gravity.

- SLO 11A.8.4.5 Explain the characteristics of specific gravity of fluids and how it may be applied to aircraft maintenance.
- SLO 11A.8.4.6 Compare and contrast potential and kinetic energy and how they apply to aircraft and/or aircraft systems.
- SLO 11A.8.4.7 Design a simple machine (on paper) that uses one or more methods of mechanical advantage.
- SLO 11A.8.4.8 List and explain the five forces or stresses affecting aircraft structures.
- SLO 11A.8.4.9 Determine which of the five forces/stresses are acting on an aircraft or aircraft parts at specific points under given conditions.
- SLO 11A.8.4.10 Explain the relationship among force, area, and pressure.
- SLO 11A.8.4.11 Calculate force, area, or pressure in a specific application.
- SLO 11A.8.4.12 Compare and contrast speed, velocity, and acceleration.
- SLO 11A.8.4.13 Define *vector*, *centripetal force*, and *centrifugal force*.
- SLO 11A.8.4.14 Define the term *heat*.
- SLO 11A.8.4.15 Explain how heat is manifested in matter and how heat transfer is accomplished through conduction and/or convection and/or radiation.
- SLO 11A.8.4.16 Identify one or more methods of heat transfer in aircraft systems, and where and how heat damage may occur when performing aircraft maintenance.
- SLO 11A.8.4.17 Perform temperature conversion calculations for centigrade, Fahrenheit, and Kelvin or absolute scales.
- SLO 11A.8.4.18 Demonstrate an understanding of linear (thermal) expansion as related to aircraft materials.
- SLO 11A.8.4.19 Define *pressure*.
- SLO 11A.8.4.20 Compare and contrast absolute and relative (gauge and differential) pressures.
- SLO 11A.8.4.21 Define Pascal's law.
- SLO 11A.8.4.22 Apply Pascal's law as it relates to the underlying principle of the hydraulic jack and hydraulic press and the force amplification in the braking system of an aircraft.
- SLO 11A.8.4.23 Explain the general effects of pressure and temperature on gases and liquids and how the qualities of compressibility and/or incompressibility of gases and liquids are generally applied to aircraft systems.
- SLO 11A.8.4.24 Explain Boyle's, Charles's, and Avogadro's gas laws, and apply them to observations of gas behaviour.

- SLO 11A.8.4.25 Explain Bernoulli's principle as it applies to a venturi.
- SLO 11A.8.4.26 Define the conditions of standard day/STP (standard temperature and pressure).
- SLO 11A.8.4.27 Apply the concepts of the gas laws to gas phase reactions; perform calculations using gas properties, masses, and volumes.
- SLO 11A.8.4.28 Perform calculations using the ideal gas equation.
- SLO 11A.8.4.29 Identify parts or systems of an aircraft where Boyle's, Charles's, and/or Pascal's laws apply.
- SLO 11A.8.4.30 List and explain the properties of sound, including frequency, wavelength, amplitude, and decibel.
- SLO 11A.8.4.31 Define sound resonance, and explain how it can be a hazard to aircraft and how sound may be used to aid in inspecting aircraft.
- SLO 11A.8.4.32 Explain the concept of the speed of sound and how it relates to aircraft.
- SLO 11A.8.4.33 Describe the composition of the atmosphere.
- SLO 11A.8.4.34 Explain temperature.
- SLO 11A.8.4.35 Describe humidity.
- SLO 11A.8.4.36 Explain the factors that determine density altitude.
- SLO 11A.8.4.37 Describe density altitude and the effects of temperature and/or pressure and/or humidity on aircraft and/or engine performance.

Goal 9: Describe **career opportunities** in aviation and aerospace technologies and associated fields.

GLO 9.1: Describe **education** and **career opportunities** and **professional organizations** in aviation and aerospace technologies and associated fields.

- SLO 11A.9.1.1 Demonstrate an awareness of careers in the area of aircraft maintenance engineering.
- SLO 11A.9.1.2 Demonstrate an awareness of post-secondary opportunities in aviation and aerospace technologies and associated fields.

Goal 10: Demonstrate an awareness of **sustainability** as it pertains to aviation and aerospace technologies.

GLO 10.1: Describe the impact of the aviation and aerospace industry on **human health and well-being**.

No applicable SLOs.

GLO 10.2: Describe the aviation and aerospace industry's sustainability practices and impact on the **environment**.

SLO 11A.10.2.1 Explain how and why lightweight and recyclable materials are used in aircraft production.

SLO 11A.10.2.2 Discuss the impact of chemical hazards on the environment.

SLO 11A.10.2.3 Describe the benefits of using environmentally friendly products and more efficiently designed aircraft.

GLO 10.3: Describe **sustainable business practices** within the aviation and aerospace industry.

SLO 11A.10.3.1 Contrast sustainable and unsustainable business practices.

Goal 11: Demonstrate an awareness of the **ethical and legal standards** as they pertain to aviation and aerospace technologies.

GLO 11.1: Practise the **ethical and legal standards** as they pertain to aviation and aerospace technologies.

SLO 11A.11.1.1 Identify the ethical and legal expectations of aviation and aerospace technicians.

Goal 12: Demonstrate **employability skills** related to aviation and aerospace technologies.

GLO 12.1: Demonstrate **employability skills** related to aviation and aerospace technologies.

SLO 11A.12.1.1 Demonstrate the criteria that comprise the Global Industry Standard of essential skills for employees.

SLO 11A.12.1.2 Demonstrate the skills listed on the Conference Board of Canada's *Employability Skills 2000+* for employees.

SLO 11A.12.1.3 Describe the skills required for a specific career path in the aviation and aerospace industry.

Goal 13: Describe the **evolution** of aviation and aerospace technologies, including **technological progression** and **emerging trends**.

GLO 13.1: Describe the **evolution** of aviation and aerospace technologies, including **technological progression** and **emerging trends**.

SLO 11A.13.1.1 Describe the evolution of aircraft design, including its technological progression and emerging trends.
