ST. FRANCIS ACADEMY

A division of St. Francis Methodist School

Curriculum Description for Australian Matriculation (Tertiary Entrance Examinations)

AVIATION

Aviation involves flying by mechanical means, especially with heavier-than-air craft. The study of aviation therefore encompasses the application of skills and understandings about the nature of the atmosphere, aerodynamics and the systems and structures designed to achieve safe and efficient flight.

Aviation has transformed the world in which we live. Efficient and reliable air transport has changed the way people travel, work, communicate and relate to each other. Simultaneously, developments in military aviation and aerospace technology have redefined approaches to national and international security. Aviation contributes significantly to the global economy and both directly and indirectly affects the lives of all the world's citizens. The nature and scope of aviation is constantly changing, driven by major developments in technology, science, education and economics. In Australia, aviation has been fundamental to overcoming problems associated with the country's physical size and population distribution.

The Aviation course draws from such diverse disciplines as Science, Engineering, Environmental Science, Social Science, Mathematics, English and Information Technology. It encompasses a range of mathematical, technological and humanities concepts and draws together a broad variety of skills, processes, understandings and strategies that promote the safe and effective operations of the aviation industry. The Aviation course provides students with the opportunity to investigate the importance of aviation to our society and learn the skills and knowledge needed to make informed decisions on issues relating to aviation and associated industries.

The Aviation course is designed to stimulate and foster intellectual curiosity and promote logical and analytical thinking. It aims to equip students to become informed citizens, able to participate in discussions about challenging technological, social and environmental issues. It enables them to achieve their own potential in all aspects of aviation and encourages them to achieve their personal best in all undertakings, and to respect the achievement of others.

Through the achievement of the Aviation course outcomes, students have the opportunity to develop their achievement of several overarching outcomes of the Curriculum Framework and a range of Learning Area outcomes. Links and interaction with the community, industry and higher education institutions will provide students with a range of vocational experiences that, together with industry expertise, will assist them to develop transferable life and work skills.

The Aviation course caters for the learning needs of all students, from those seeking a career in aviation, science or engineering, to others pursuing an avid interest in the subject. Achievement of the course outcomes may be used by students in the selection process for university and TAFEWA colleges. Students undertaking relevant Vocational Education and Training (VET) programs may use evidence of their achievement of competencies toward recognition of achievement of related course outcomes.

The course also caters for students who do not wish to pursue further studies beyond Year 12. Course content is sufficiently diverse to provide students with the necessary foundation to meet employment needs in a range of occupations not limited to the aviation industry.

Through engaging with this course, students have the opportunity to further their achievement of specific overarching learning outcomes from the Curriculum Framework. The course also provides opportunities for the promotion of core-shared values identified from the Curriculum Framework.

Course outcomes
The Aviation course is designed to facilitate the achievement of four outcomes. These outcomes are based on the Science, Mathematics, Society and Environment, and Technology and Enterprise learning area outcomes in the Curriculum Framework. Outcomes are statements of what students should know, understand, value and be able to do as a result of their learning.

Outcomes are elaborated into aspects that identify the underpinning knowledge, concepts and/or skills in more detail.

Outcome 1: Aviation systems
Students understand components of, and interactions between aviation systems.
In achieving this outcome, students:
- understand the components of aviation systems; and
- understand the interactions between aviation systems.

Outcome 2: Aviation operations
Students apply processes to plan aviation operations.
In achieving this outcome, students:
- collect, organise and interpret operational information; and
- plan aviation operations.

Outcome 3: Aviation applications
Students apply a range of skills and processes to perform specific aviation operations.
In achieving this outcome, students:
- apply operational, organisational and communication skills and processes appropriate to aviation operations;
- monitor and evaluate variables in aviation systems; and
- implement a course of action and manage resources.

Outcome 4: Aviation development
Students understand the influences on aviation developments and their impact on society.
In achieving this outcome, students:
- understand significant aviation developments and their impact on society; and
- understand that significant aviation development is influenced by the needs of society.

For each of these outcomes, standards are defined in terms of progressive levels of achievement (see Course Standards).

Course content
The course content needs to be the focus of the learning program. It enables students to maximise their achievement of both the overarching learning outcomes from the Curriculum Framework and the Aviation course outcomes. By engaging with this essential content, students can demonstrate their achievement.

It is advised that the course content is best delivered in paired units: 2A and 2B; 3A and 3B.

The course content is divided into four content areas:
- aerodynamics
- performance and operation
- human factors
- aviation development.

Aerodynamics

Principles of flight

The nature of air as a fluid interacting with an aircraft underpins the understandings of aerodynamics (Bernoulli's Principle, Newton's Third Law of Motion). Various factors affect the capacity to generate and/or influence the aircraft lifting and controlling forces (lift/drag formulae). The forces acting on an aircraft or helicopter in all phases of flight, including subsonic through to hypersonic flight, turning, climbing, descending, cruise and within space are explored, together with aircraft controls and their effects in the air, on the ground and in space, stability and instability of aircraft and the ability of aircraft to manoeuvre.

Performance and operation

Propulsion

Since the first official powered flight in 1903, aircraft have been powered by an array of different engines ranging from the basic two-stroke reciprocating engine to the supersonic combustion ramjet engine (Scramjet). Knowledge of the basic structure, principles of operation and operating procedures are explored leading to a comprehensive understanding of aircraft propulsion.

Aviation systems and structures

Aircraft range in size, type and complexity from balloons, gliders and basic powered training aeroplanes and helicopters to modern airliners and sophisticated spacecraft. The physical structure and design of aircraft must take account of the stresses and tensions acting on an aircraft during every flight. Knowledge of the evolution of aircraft systems and structures leads to a clearer understanding of present design and appreciation of future innovations.

Aircraft performance

The limiting effects of environmental conditions and aircraft power factors are evaluated and applied to the operation of the aircraft during ground movement and throughout the flight. Aircraft limitations include weight and balance of the aircraft through loading, takeoff and climb performance, altitude, endurance, range and speed according to available engine power and atmospheric conditions. A number of processes are involved to select information accurately, calculate, interpret and apply performance and operational data.

Aviation law

Aviation operations in Australia are governed by a legislative framework that stems from association with the International Civil Aviation Organisation (ICAO). Knowledge of the structure of legislation and other documents outlining aviation regulations and requirements in Australia is examined. Rules and regulations governing pilot operations are identified and appropriate regulatory publications and documents used to extract this information.

Navigation, meteorology and radio communication

The fundamental function of aviation is to move aircraft through the sky from one point to another in a variety of meteorological conditions. Communication supports the safety of aircraft in the air and on the ground. Understanding of basic principles of navigation, propagation and communication, interpretation of aviation charts and forecasts, development of navigation processes and techniques and applying meteorological influences, and the development of correct use of radio communication and phraseology, ensures safer skies and airports.

Human factors

Aviation safety

Aviation safety relates to the recognition of responsibilities in operating and working with aircraft and at airports. Knowing normal operational and emergency procedures and processes and safety management strategies protects lives in the aircraft and on the ground. The provision of a secure operational aviation environment, free from deliberate interference due to sabotage or terrorism, has become an area of increasing concern in both commercial and military aviation. Lessons of safety and security have been learnt from past incidents and accidents. Case studies are used to identify causal factors in aviation incidents and accidents, and to investigate aviation occupational health and safety (OH&S) issues. Australia's attitude towards safety has proved outstanding. However, some parts of the world have a less-stringent attitude toward safety, resulting in aircraft losses and fatalities.

Human performance and resource management
The physical, psychological and emotional makeup of the human organism places limitations on safe human performance in aviation operations. This strongly influences resource management in aviation, including the effective use of human resources, physical resources and information. Resource management involves team strategies, problem-solving strategies, clearly-defined tasks, effective decision-making strategies, understanding of culture within decision-making processes, leadership and communication, workload management, situational awareness and managing workplace relations. Tools such as checklists are utilised to self assess an operation and one's ability to perform it.

Aviation development

Aviation history and developmental influences
Many individual achievements and technological developments have resulted in the rapid expansion of the aviation industry. While early aviation was driven by the desire to fly, subsequent advances in technology have impacted significantly on aviation development and our society. The recognition of the achievements of pioneering individuals and an understanding of the technological advancements in aviation, provide an insight into the possible future trends of air travel.

Course units
To cater for the full range of students, six units have been developed to sequence the syllabus content. Stage 1 units enable student achievement at levels 3 to 5; Stage 2 units at levels 4 to 6; and Stage 3 units at levels 6 to 8.

Each of the units is designed around the same essential content areas which increase in complexity from one unit to the next. Each unit allows students to achieve all four of the course outcomes.

Unit 1AAVN
The focus for this unit is on basic aviation concepts in contexts related to **glider operations.** Students gain an understanding of aerodynamic principles associated with non-powered craft, identifying aerodynamic structures and flight controls incorporated into their design.

Unit 1BAVN
The focus for this unit is on basic aviation concepts in contexts related to **ultralight and sport aviation.** Students are introduced to aircraft structures and the forces acting on powered aircraft during flight.

Unit 2AAVN
The focus for this unit is on aviation concepts in contexts related to **flying training: general aviation**. Students understand the basic principles of flight associated with fixed wing aircraft. They gain an understanding of the internal combustion engine and related propulsive devices. Aircraft systems are examined and components and purposes identified.

Unit 2BAVN
The focus for this unit is on aviation concepts in contexts related to **flying training: general aviation.** Students learn about the principles of flight associated with rotary wing aircraft. They understand the purpose and necessity of civil aviation publications, identify specific rules and regulations governing flight in and around controlled and uncontrolled aerodromes and understand the meteorological conditions that may affect flight.

Unit 3AAVN
The focus for this unit is on aviation concepts in contexts related to **flying training: advanced aviation**. Students investigate the aerodynamic principles of Bernoulli, Coanda Effect and Newton, explore the disposition of forces in specific flight manoeuvres, investigate various types of aircraft stability and understand how aircraft are flown to achieve specific flight characteristics. They learn how to prepare a map for navigation and flight planning purposes and use radio navigation aids to supplement navigation. The interaction of weather on aviation operations, and the rules regarding visibility are investigated.

Unit 3BAVN
The focus for this unit is on aviation concepts in contexts related to **flying training: advanced aviation**. Students further their understanding of aircraft operations and human limitations in relation to flight. They explore current types of propulsion used in commercial and military jet aircraft and investigate aerodynamic principles associated with subsonic and supersonic flight.

Examination details
External assessment is a requirement for students aspiring to university selection. Students need to complete at least two units from 2A—3B to be eligible to sit the WACE exam.

The exam has 2 components: a practical component of 30 minutes, and a written paper of 2 hours 30 minutes plus 10 minutes reading time. The total examination length is 3 hours and 10 minutes.

The written paper consists of three sections:
A: Multiple choice questions.
B: Short answer questions.
C: Extended answer questions.