Government of **Western Australia**
School Curriculum and Standards Authority

SAMPLE COURSE OUTLINE

AVIATION
GENERAL YEAR 12

Sample course outline

Aviation – General Year 12

Unit 3 and Unit 4

Semester 1

Week	Key teaching points
1–3	**Introduction** • structure of the syllabus • course outline • assessment outline • school assessment policy **Aerodynamics: Principles of flight** • review disposition of forces of an aircraft in level flight, a climb with power, descent, glide and turn • aerodynamic characteristics of stalling and spinning • wing loading and load factor calculations and consequent increase in stall speed • factors affecting directional stability: position of centre of gravity, size of the fin and rudder movement • factors affecting lateral stability: high and low wing configurations, dihedral configurations, sweepback • factors affecting longitudinal stability: position of centre of gravity, movement of centre of pressure, changes in thrust, tailplane movement • spiral instability, static and dynamic stability • purpose and operation of trim tabs, stability • purpose and use of spoilers and speed brakes **Task 1:** Principles of flight test
4–6	**Aviation development** • factors influencing the ongoing development and/or likely impact of: ▪ aircraft capacity and range ▪ power plants (fuel efficiency, electric) ▪ safety management system ▪ unmanned aerial vehicle (UAV) ▪ aircraft noise • issues affecting aviation development and their likely impact on aviation and the community, including: ▪ air traffic growth in Asia ▪ air traffic congestion in Europe and USA ▪ low cost carriers **Task 2:** Investigation – Aviation development literature search and oral presentation (jigsaw activity – students are allocated topics from the syllabus to research and present their findings in a 5–10 minute oral presentation)
7–11	**Performance and operation: Navigation, meteorology and radio communication** • air navigation terminology, including: indicated air speed, calibrated airspeed, drift, estimated time of departure, actual time of departure, estimated time of arrival, actual time of arrival, estimated time interval, actual time interval, air position, dead reckoning position, track required, track made good, and cross wind component • principles of air navigation, including ▪ application of magnetic variation and deviation in the operation of the compass ▪ the relationship between heading/TAS, wind speed and direction, and track and ground speed (triangle of velocities)

Week	Key teaching points
	▪ using a map, calculate one of the velocities, given the other two ▪ determination of drift angle (track made good to track required) and the adjustment required to correct it and return to the track required by a given point, using a map ▪ performing speed/time/distance/fuel calculations, using a calculator ▪ determining head/tailwind and crosswind components graphically, given a wind velocity and direction • time ▪ effects of Earth's rotation and revolution around the Sun in relation to beginning and end of daylight and period of daylight • flight planning ▪ the purpose and use of QNH, QFE, 1013 hPa pressure datums ▪ the purpose and distinction between the use of flight levels and altitude ▪ the concepts of pressure height and density height • principles of operation, purpose and limitations of the: ▪ inertial navigation system (INS) ▪ global navigation systems (GPS, Galileo, Glonass) ▪ primary surveillance radar (PSR) ▪ secondary surveillance radar (SSR) ▪ instrument landing system (ILS) ▪ automatic dependent surveillance broadcast (ADSB) • visual approach slope guidance systems (T-VASIS, VASIS, PAPI) **Aviation skills: Practical flight skills** Flight simulation (one lesson per week – five weeks) **Task 3:** Practical skills test
12–13	**Performance and operation: Navigation, meteorology and radio communication** • general concepts of meteorology ▪ cloud formation processes ▪ atmospheric stability and instability, adiabatic process, environmental lapse rate ▪ synoptic chart interpretation ▪ seasonal weather conditions in different regions of Australia with respect to visibility, prevailing winds, typical cloud patterns and precipitation, seasonal pressures and frontal systems, and tropical cyclones ▪ the purpose of the current weather forecasts and reports used by general aviation ▪ occurrence and formation of thunderstorms, low cloud, fog (advection and radiation), poor visibility, turbulence, thermals, dust devils, wind shear, microbursts, tropical cyclones and the nature of the hazard which each poses to aircraft operations **Task 4:** Navigation, meteorology and radio communication test **Task 5:** Externally set task
14–15	**Aviation skills: Process skills** • identify potential safety hazards • communicate effectively with others in verbal or written forms • record observations verbally and graphically • research and extract relevant information • make reliable measurements and accurately record data **Task 6:** Investigation – Report of a simulated flight activity

Semester 2

Week	Key teaching points
1–6	**Performance and operation: Aircraft performance** • airspeed limitations: normal operating speed (Vno), never exceed speed (Vne), maximum manoeuvring speed (Va), turbulence penetration speed (Vb), flap operating speed (Vfo), flap extension speed (Vfe), stall speed (Vs) in clean and landing configuration • configuring an aircraft for maximum range or maximum endurance • the effect of altitude on engine performance • design and operation of turbochargers and superchargers • using the Piper Turbo Lance aircraft as an example of an advanced light aircraft, determine, under a range of parameters: ▪ fuel use, time and distance to climb and descend ▪ TAS, cruise power settings and associated rates of climb • purpose, components and operation of basic aircraft electrical, hydraulic, pressurisation and de-icing systems • principles of operation of constant speed propeller engine • coordinated use of throttle and propeller pitch to maintain a desired power setting • variation of propeller design, including full feathering and reverse pitch • correct use of mixture control, manifold air pressure, and engine RPM controls • purpose of engine manifold air pressure gauge • principles and operation of turbine engines, Newton's Third Law • differences between turbofan, turbojet and turboprop engines, and their individual advantages and limitations • thrust reversal systems • development of EFIS/HUD glass cockpit • presentation of information on EFIS and HUD displays, advantages and disadvantages of each on aircraft operations **Task 7:** Investigation – Aircraft performance (using the Piper Turbo Lance aircraft as an example of an advanced light aircraft, determine, under a range of parameters: fuel use, time and distance to climb and descend; TAS, cruise power settings and associated rates of climb) **Aviation skills: Practical flight skills** Flight simulation (one lesson per week – five weeks) **Task 8:** Practical skills test (Week 6)
7–12	**Human factors: Aviation safety** • common causes of general aviation aircraft accidents • reasons for incorporating TEM into aircraft operations • effects of human factors on aviation safety, including stress, training, fatigue, communication skills, assertiveness and judgement, cockpit culture • effects on aviation safety of aircraft design, ergonomics, maintenance, air traffic control, and meteorological factors • the importance of situational awareness on decision making associated with safe flight **Human factors: Human performance** • causes, symptoms and remedies of hypoxia and hyperventilation • causes and effects of decompression sickness after scuba diving and its relationship to flight • role of the semi-circular canals in visual meteorological conditions (VMC) and instrument meteorological conditions (IMC) • effects and dangers of spatial disorientation • physiological effects of noise • standards and effects of visual acuity required of a pilot • effect on visual acuity of acceleration forces, dietary deficiencies, hypoxia, and carbon monoxide poisoning • problems in flight associated with colour blindness, smoking, drugs, flicker vertigo, night operations

Week	Key teaching points
	• effects of colour vision defects in aviators • the effects of common eye deficiencies, including myopia, hypermetropia, astigmatism and presbyopia in flight, if uncorrected • common visual illusions that affect aircrew • sources, symptoms and effects of carbon monoxide poisoning, and the effect of breathing air contaminated by other noxious products, including fuel • effects on pilot performance of smoking, alcohol and drugs, including both medical and illegal drugs • regulations pertaining to drugs and alcohol in aviation • causes, symptoms and treatment for motion sickness • effects on the human body of positive and negative accelerations (g-forces) • g-induced loss of consciousness (G-LOC) and methods of reducing adverse effects of G-LOC, such as pressure suits • stages leading to G-LOC **Task 9:** Human factors test
13–15	**Aerodynamics: Principles of flight** • rotary wing ▪ forces acting on helicopters in flight ▪ principles of lift and drag ▪ helicopter controls ▪ flight manoeuvres – hovering, transition and translational lift, cruise, descent, vertical ascent and descent (autorotation) ▪ principles associated with helicopter operation, including gyroscopic precession, retreating blade stall, coning, Coriolis effect, tail rotor drift **Task 10:** Investigation – Helicopter design (students plan, conduct, process and interpret data using model helicopters; they evaluate their plan, procedures, data and findings; and communicate their conclusions)