**Sample Course Outline**

Aviation

ATAR Year 11

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Sample course outline

Aviation – ATAR Year 11

Unit 1 and Unit 2

Semester 1

| **Week** | **Key teaching points** |
| --- | --- |
| 1–4 | **Aerodynamics: Principles of flight**   * basic aerodynamic terms, including: aerofoil, span, chord, camber, thickness/chord ratio, relative airflow, angle of attack, angle of incidence, wing loading, total reaction, lift, drag, aerodynamic stall, lift/drag ratio, laminar flow, turbulent flow and boundary layer * explanation of lift generation in terms of Newton’s Third Law of Motion, Bernoulli’s Principle, and Coanda effect * difference between stable, neutrally stable and unstable flight states * terminology: directional, lateral and longitudinal stability * lift and drag formulae and associated terminology: coefficient of lift, coefficient of drag, dynamic pressure, static pressure, total pressure * graphical representation of total drag: induced, and profile drag * purpose and/or operation of the aerodynamic design features: aspect ratio, wash out, flaps, fixed canards and trim tabs * wake turbulence   **Task 1:** Aerodynamics test  Start research for **Task 4**: Aviation development |
| 5–6 | **Performance and operation: Navigation, meteorology and radio communication**   * concept of control and monitoring in three dimensions, requirements for visual flight, and additional requirements for flight in instrumental meteorological condition (IMC) * gyroscopic flight instruments: purpose, operation and limitations of the attitude indicator, direction indicator and turn coordinator * the effects of failure of gyroscopic flight instruments * purpose, operation, limitations and errors of the pitot static system and its instruments: the airspeed indicator, altimeter and vertical speed indicator * the effects of failure of either pitot or static pressure source * magnetic compasses: principles of operation, characteristics and general limitations of use   **Aviation skills: Practical flight skills (Flight simulation – one lesson per week)**   * use of Microsoft Flight Simulator – Cessna 172 to demonstrate general handling of aircraft including: * normal take-off and climb * straight and level flight * climbing and descending * climbing and descending turns * medium turn * trim for climb, descent and cruise attitudes   **Aviation skills: Process skills**   * identify potential safety hazards * record observations verbally and graphically * communicate effectively with others in verbal or written forms * research and extract relevant information |

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| --- | --- |
| 7–10 | **Performance and operation: Navigation, meteorology and radio communication**   * navigation * basic navigation terms, including: track, heading, distance, time, true air speed, wind velocity, ground speed, magnetic north, true north, magnetic variation, bearings, relative bearings, position lines and fix * properties associated with Mercator and Lambert Conformal conic projections * difference between great circles and rhumb lines * locating points on the Earth’s surface by parallels of latitudes and meridians of longitude * difference between geographic and magnetic poles * magnetic variation and isogonals * principles of operation, purpose and limitations of Backup (Legacy) radio navigation systems:   + automatic direction finder (ADF)   + VHF omni-range (VOR)   + distance measuring equipment (DME) * maps and documents in navigation: World Aeronautical Chart (WAC), Visual Terminal Chart (VTC), Visual Navigation Chart (VNC), En-route Chart (ERC) Low, Planning Chart Australia (PCA), En-Route Supplement Australia (ERSA) * Notice to Airmen (NOTAM)   **Aviation skills (Flight simulation)** |
| 11–14 | **Performance and operation: Navigation, meteorology and radio communication**   * basic navigation principles * track and distance determination using appropriate navigation equipment * estimating track and distance without equipment * application of magnetic variation in the operation of the compass * bearings, relative bearings, position lines and obtaining a fix * conversions of length, speed, weight and volume units, including feet/metres, nautical miles/kilometres, pounds/kilograms, US gallons/litres/kilograms of avgas * map reading: map to ground, ground to map, topographical features using a WAC chart * time * Coordinated Universal Time (UTC), local mean time, local standard time, local summer time * effect of changes of longitude on local mean time * conversions between local mean time, UTC, local standard time and summer time * effects of Earth’s rotation and revolution around the Sun in relation to beginning and end of daylight and period of daylight * general concepts of meteorology * International Civil Aviation Organisation (ICAO) Standard Atmosphere * divisions of the atmosphere * Earth’s general wind circulation * variation in atmospheric pressure * formation of pressure systems * pressure systems terminology, including high, low, ridge, trough, col * local winds, including land and sea breezes, katabatic and anabatic winds, and fohn winds * classification of cloud types * describing cloud cover measuring in OKTAs * humidity, relative humidity, dew point temperature * air masses affecting Australia * introduction to synoptic charts * weather associated with pressure systems * frontal systems   **Task 2:** Practical examination  **Task 3:** Performance and operation test |

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| --- | --- |
| 15 | **Aviation development: Aviation history and developmental influences**   * civilian and military aviation development since the Wright brothers’ first flight, including: * technology (aircraft design, engines, avionics, all-weather ops) * impact on social and economic development   **Task 4:** Investigation – Aviation development |
| 16 | **Task 5:** Written examination |

Semester 2

| **Week** | **Key teaching points** |
| --- | --- |
| 1–2 | **Aerodynamics: Principles of flight**   * disposition of forces of an aircraft in level flight, a climb with power, descent, glide and turn * purpose and use of primary flight controls: elevator, aileron and rudder |
| 3–4 | **Performance and operation: Navigation, meteorology and communication**   * principles of radio wave propagation, including amplitude and cycle * characteristics associated with radio wave propagation in the ultra-high frequency (UHF), very high frequency (VHF), high frequency (HF) bands and medium frequency (MF) band * definitions: frequency, attenuation, reflection, refraction * determining approximate VHF range using the line-of-sight formula * phonetic alphabet * obtaining required radio frequencies from aviation documentation * operation of basic light aircraft radio systems * significance of taxiway and runway markings * terminology associated with the legs of a circuit * characteristics of registered, certified, authorised landing areas and helicopter landing sites * significance of ground symbols near the windsock, on the movement area and on runways * air traffic control (ATC) light signals * visual flight rules (VFR), including visual meteorological conditions (VMC) below 10,000ft in Australian airspace   **Task 6:** Performance and operation – Navigation test  **Aviation skills (Flight simulation)** |
| 5–7 | **Performance and operation: Propulsion**   * components of an internal combustion engine * principles of operation of an internal combustion diesel and petrol engine * engine timing and necessity of valve lead, lag and overlap * internal combustion engines used in aircraft, including horizontally opposed, in-line, rotary and radial * correct engine management using tachometer, oil temperature, oil pressure, fuel pressure, cylinder head temperature and exhaust gas temperature gauges * purpose, components and operation of the ignition, lubrication, induction, carburetion, fuel injection and fuel systems * aerodynamic principles associated with fixed pitch propellers * changing angles of attack of propeller blades during acceleration * limitations of fixed pitch propellers * effects of propeller operation, including slipstream, torque and gyroscopic effects   **Task 7:** Investigation – Development of petrol/diesel engines  **Aviation skills (Flight simulation)** |
| 8–9 | **Performance and operation: Aviation law**   * role of International Civil Aviation Organisation (ICAO) * role of Civil Aviation Safety Authority (CASA) * Australian aviation legislative framework and other documentation, including *Air Navigation Act 1920*, Air Navigation Orders, Aeronautical Information Publication, Civil Aviation Advisory Publications, Civil Aviation Regulations, Civil Aviation Safety Regulations, Civil Aviation Orders, Enroute Supplement Australia (ERSA) * airspace classifications used in Australia for terminal and en-route airspace, including controlled and non-controlled aerodromes used by general aviation aircraft * terminology: air traffic control, control area, control zone, controlled airspace, VFR lanes of entry and reporting points, prohibited, restricted and danger (PRD) areas and common traffic advisory frequency (CTAF) airspace * clearance requirements at towered aerodromes * broadcast requirements at CTAF aerodromes   **Task 8:** Performance and operation – Aviation law test  **Aviation skills (Flight simulation)**  **Task 9:** Practical examination |
| 10–11 | **Performance and operation: Aircraft performance**   * determination of pressure and density height for take-off and landing * factors which affect take-off and landing performance * calculation of take-off and landing distances for Cessna 172 * aircraft loading terminology, including: arm, moment, datum, station, index unit, Centre of Gravity (CoG) and CoG limits, basic empty weight, zero fuel weight, ramp weight, maximum take‑off weight * conversion of fuel volume to weight, conversion of weight units * derive loading information from loading charts (Alpha, Bravo and Charlie) * complete loading problems, including determining Centre of Gravity (CoG) position within limits (and possible redistribution if CoG found to be outside limits)   **Task 10:** Performance and operation – Aircraft performance test |
| 12–13 | **Human factors**   * basic structure and function of the respiratory system * basic structure and function of the circulatory system * basic structure and function of the ear, both auditory and vestibular systems * basic structure and function of the eye * standards of visual acuity required of a pilot * night vision   **Task 11:** Human factors test |
| 14–15 | **Aviation development: Aviation history and developmental influences**  * the structure of and services provided by aviation in Australia today, including: * airlines * charter * airwork (air freight, Royal Flying Doctor Service (RFDS), training, agricultural, coastal surveillance) * recreation * military * support functions provided by: * CASA * airports * ground support (maintenance, catering, baggage handling) * air traffic control (ATC) * Rescue and Fire Fighting Services (RFFS) * meteorological services |
| 16 | **Task 12:** Written examination |