**Sample Course Outline**

Engineering Studies

ATAR Year 11

For teaching in 2024

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# 2024 Sample course outline

# Engineering Studies – ATAR Year 11

## Unit 1 and Unit 2

## Semester 1

| **Week** | **Key teaching points** |
| --- | --- |
| **Term 1**  1–2 | Overview of Unit and assessment requirements  Introduction to design process  **Engineering design process**  **Investigating**   * develop a design brief in response to a problem, need or opportunity, given guidelines and a context * conduct research to identify and assess existing solutions/products * research and critique materials and components relevant to the design brief * consider different ways to supply energy for efficient and effective functioning of the design   **Task 1 Part A:** **Design project** (include title or theme)   * develop the first part of a design folio * develop a design brief and investigate existing products, materials and ideas |
| 3–7 | **Materials**  **Types and classification**   * define   + metals (pure)   + alloys   + polymers   + composite * classify   + metals (pure)   + alloys   + polymers   + composite   **Effects on society, the environment and business**  **Energy**   * energy, work, and power – definitions and examples * conservation of energy – definition and examples * forms of energy – kinetic and potential – definition and examples * non-renewable sources of energy – fossil fuels: coal, gas, and oil; nuclear * renewable sources of energy – solar (thermal and photovoltaic), wind, hydroelectric, geothermal, ocean (tidal and waves), hydrogen (assuming production uses renewable sources) * advantages and disadvantages for society, the environment and industry of obtaining and using non-renewable and renewable sources of energy   **Task 2A: Investigate energy, power and work**   * research, list, define and compare forms of energy * list and outline advantages and disadvantages for society, the environment and industry of obtaining and using renewable and non-renewable forms of energy * determine form of energy suitable for the project   **Task 2B: Investigate fundamental engineering calculations and mechanisms**  Fundamental engineering calculations from Unit 1, including:   * dimensional – examine dimensioned drawings * perimeter – determine perimeter * surface area – determine surface area * volume – determine volume   Use units and prefix, symbols and factors  **Mechanisms**   * mechanical advantage (MA) * velocity ratio (VR) * explain and give examples of the listed types of motion * recognise and describe general characteristics and applications for the listed types of mechanisms |
| 8–10 | **Study of specialist engineering fields**  Learning of specialist theory and specific understandings from **one** of the following specialist engineering fields:   * **Mechanica**l, including content of Unit 1 from Materials, Units, and Statics   + - * **Mechatronics** including content of Unit 1 from Electrical and electronics – Components and equipment, Laws and principles, Units, and Systems and control – diagrams |

| **Week** | **Key teaching points** |
| --- | --- |
| **Term 2**  1–6 | **Task 1 Part B: Developing a solution for the project**   * research materials and components suitable for the development of a solution   **Engineering design process**  **Producing**   * present specifications for the selected solution   + annotated pictorial drawings   + 3rd angle projections that comply with the accepted standards for     - lines – outlines, hidden detail and centrelines     - dimensioning – linear, radii, circles, through holes and partial depth holes with flat base   + selected materials with justification of choices   + parts lists   + costing of project, i.e. prototype or working model   **Task 5: Pre-production**   * complete skills development exercises * document process in folio/work log/time sheet   **Producing**   * project management skills for timely completion and testing of the project * construct prototype or working model by selecting and using appropriate tools and machines, and by following safe work practices   **Task 1 Part C: Evaluation of the development of the project**   * meeting the requirements of the design |
| Examination  weeks | **Task 4: Semester 1 examination** – approximately two hours, using a modified examination design brief from the Year 12 syllabus |

## Semester 2

| **Week** | **Key teaching points** |
| --- | --- |
| **Term 3**  1–3 | **Materials**  **Properties**   * define   + density   + elasticity   + plasticity   + ductility   + malleability   + strength     - tensile     - compressive     - torsional     - shear   + stiffness   + toughness   + conductivity     - thermal     - electrical   + corrosion resistance   + hardness * fitness for purpose   + identify and describe the properties of a material required for a specified application   **Fundamental engineering calculations**  **Density**   * density = ρ = kg m-3   **Quantity estimates**   * determine the following for individual and simple combinations of previously specified Unit 1 geometric forms (may be solid and/or hollow)   + surface area   + volume   + mass   + density   **Efficiency**   * calculate efficiency as a percentage   + *η* = × 100%   **Unfamiliar formula**   * determine unknown factor in unfamiliar formula given sufficient data to complete the calculation |
| 4 | **Task 3: Obsolescence assignment**   * define and compare the three forms of obsolescence * write about the advantages and disadvantages for society, industry and the environment that result from the different forms of obsolescence   **Effects on society, the environment and industry**  **Obsolescence**   * define and compare forms of obsolescence   + technical   + functional   + planned * advantages and disadvantages for society, industry and the environment that result from the different forms of obsolescence |
| 5–8 | **Study of either specialist engineering fields:**  Learning of specialist theory and specific understandings from **one** of the following specialist engineering fields:   * **Mechanical**, including content of Unit 2 from Materials, stress and strain, hardness test, toughness, shear strength and stress, and dynamics, and Units * **Mechatronics**, including content of Unit 2 from Systems and control – Interfacing with microcontroller, Electrical and electronics – Laws and principles, Flow charts. |
| 8–10 | **Task 6:** **Manufacture of proposed project**  Using prepared production plan, materials and available equipment, construct a prototype or working model and record progress in design folio.  **Producing**   * project management skills for timely development and testing of the project * construct prototype or working model by selecting and using appropriate tools and machines, and by following safe work practices * test the prototype or working model for correct function and document using checklists and test data |

| **Week** | **Key teaching points** |
| --- | --- |
| **Term 4**  1–5 | **Task 6:** **Manufacture of proposed project (continuation)**  Using prepared production plan, materials and available equipment, construct a prototype or working model and record progress in design folio.  **Producing**   * project management skills for timely development and testing of the project * construct prototype or working model by selecting and using appropriate tools and machines, and by following safe work practices * test the prototype or working model for correct function and document using checklists and test data |
| 6 | **Task 7: Evaluation of completed project**  Prepare written report on and photographs of completed project.  **Evaluating**   * evaluate the development of the project   + meeting the requirements of the design   + safety, function fit and finish   + modifications and changes to the design during production |
| Examination weeks | **Task 8: Semester 2 examination** –of approximately 2 hours, using a modified examination design brief from the Year 12 syllabus |