



SAMPLE COURSE OUTLINE

ENGINEERING STUDIES (MECHATRONICS)

ATAR YEAR 12

Acknowledgement of Country

Kaya. The School Curriculum and Standards Authority (the Authority) acknowledges that our offices are on Whadjuk Noongar boodjar and that we deliver our services on the country of many traditional custodians and language groups throughout Western Australia. The Authority acknowledges the traditional custodians throughout Western Australia and their continuing connection to land, waters and community. We offer our respect to Elders past and present.

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2025 Sample course outline
 Engineering Studies – ATAR Year 12 (Mechatronics)
 Unit 3 and Unit 4
 Semester 1

Week	Key teaching points
1–3	<p>Overview of unit and assessment requirements Introduction to design process</p> <p>Engineering design process (Core – Unit 3)</p> <p>Investigating</p> <ul style="list-style-type: none"> develop a comprehensive design brief in response to a problem, need or opportunity (student and/or teacher directed) conduct research to identify and assess existing solutions or similar 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 <p>Devising</p> <ul style="list-style-type: none"> produce annotated pictorial sketches and/or drawings of design ideas produce annotated third-angle orthographic sketches of design ideas compare and analyse alternative designs and justify the choice of options to be used as the solution <p>Effects on society, the environment and industry (Core – Unit 4)</p> <p>Life cycle analysis of engineered products</p> <ul style="list-style-type: none"> define the term ‘life cycle analysis’ describe stages of the life cycle describe effects on society, the environment and industry that occur during the life cycle of engineered products <p>Task 1A: Problem statement and design brief</p>
4–5	<p>Materials</p> <p>Types and classification (Core – Unit 3)</p> <ul style="list-style-type: none"> define and compare classify <p>Properties (Core – Unit 4)</p> <ul style="list-style-type: none"> define and compare fitness for purpose <p>Effects on society, the environment and industry (Core – Unit 3)</p> <p>Energy</p> <ul style="list-style-type: none"> 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, industry and the environment of obtaining and using non-renewable and renewable sources of energy

Week	Key teaching points
	<p>Fundamental engineering calculations (Core – Unit 3)</p> <ul style="list-style-type: none"> • dimensional • perimeter • surface area • volume <p>Fundamental engineering calculations (Core – Unit 4)</p> <ul style="list-style-type: none"> • density • quantity estimates • efficiency • energy, work and power <p>Task 1B: Concepts</p> <p>Task 2: Test – Core theory: Orthographic drawings and fundamental engineering calculations (Unit 3 [50%] and Unit 4 [50%])</p>
6–10	<p>Engineering design process (Core – Unit 3)</p> <p>Producing</p> <ul style="list-style-type: none"> • present specifications for the selected solution • display project management skills for timely development and testing of project • construct the prototype or working model by selecting and using appropriate tools and machines, and by following safe work practices • test those aspects of the prototype or working model that have been completed for correct function and document using checklists and test data <p>Study of specialist engineering field – Mechatronics</p> <p>Electrical and electronics</p> <p>Components and equipment (Mechatronics – Unit 3)</p> <ul style="list-style-type: none"> • circuit symbol • read and understand markings • read and sketch circuit diagrams that contain listed components • multimeter <p>Laws and principles (Mechatronics – Unit 3)</p> <ul style="list-style-type: none"> • charge • Ohm’s law • power • voltage • current • resistance • Kirchoff’s laws • cells and batteries • resistor networks • capacitor networks • voltage dividers • diodes <p>Laws and principles (Mechatronics – Unit 4)</p> <ul style="list-style-type: none"> • NPN transistor model • Darlington pair • data extraction <p>Evaluating (Core – Unit 3)</p> <ul style="list-style-type: none"> • evaluate the development of the project

Week	Key teaching points
11–13	<p>Systems and control Interfacing with microcontroller (Mechatronics – Unit 4)</p> <ul style="list-style-type: none">• microcontroller• digital inputs• analogue inputs• digital outputs <p>Task 3A: Project build (electrical) Task 3B: Build documentation (electrical) Task 4: Test – Mechatronics: Electronics, interfacing and circuit theory (Unit 3 [50%] and Unit 4 [50%])</p>
14 -15	<p>Task 5: Semester 1 examination based on Unit 3 (50%) and Unit 4 (50%) content</p>

Semester 2

Week	Key teaching points
1–5	<p>Overview of unit and assessment requirements</p> <p>Engineering design process (Unit 4)</p> <p>Producing</p> <ul style="list-style-type: none"> • present specifications for the selected solution • display project management skills for timely completion and testing of project • construct the 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 <p>Mechanisms</p> <p>Simple machines and mechanisms (Core – Unit 3)</p> <ul style="list-style-type: none"> • mechanical advantage (<i>MA</i>) • velocity ratio (<i>VR</i>) • explain and give examples of types of motion • recognise and describe general characteristics and applications of drive systems <p>Fundamental engineering calculations (Core – Unit 4)</p> <ul style="list-style-type: none"> • mechanical advantage (<i>MA</i>) • velocity ratio (<i>VR</i>) • rack and pinion – lead screw • ideal machine (100% efficiency) • speed • torque • unfamiliar formula
6–11	<p>Engineering design process (Core – Unit 4)</p> <p>Producing</p> <ul style="list-style-type: none"> • present specifications for the selected solution • display project management skills for timely completion and testing of project • construct the 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 documents using checklists and test data <p>Systems and control</p> <p>Systems and control diagrams (Mechatronics – Unit 3)</p> <ul style="list-style-type: none"> • universal block diagram • subsystem diagram • open-loop • closed-loop <p>Flow charts (Mechatronics – Unit 4)</p> <ul style="list-style-type: none"> • standard symbols • interpret flow charts • draw flow charts <p>Task 6A: Project build (structural, mechanical and control)</p> <p>Task 6B: Build documentation (structural, mechanical and control)</p> <p>Task 7: Test – Mechatronics: Structural, mechanical and control (Unit 3 [50%] and Unit 4 [50%])</p>

Week	Key teaching points
12–14	Evaluating (Core – Unit 4) <ul style="list-style-type: none">• evaluate the resulting prototype or working model Task 1C: Project evaluation
15	Task 8: Semester 2 examination based on Unit 3 (50%) and Unit 4 (50%) content