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

SAMPLE COURSE OUTLINE

ENGINEERING STUDIES

ATAR YEAR 11

FOR TEACHING IN 2024

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.

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

Week	Key teaching points
	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 = $\frac{m}{V}$ 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 ▪ $\eta = \frac{Output}{Input} \times 100\%$ **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

Week	Key teaching points
	▪ 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