# Pre-approved Learning and Assessment Plan

Stage 2 Robotic and Electronic Systems (make it move) (from 2022)

Pre-approved learning and assessment plans are for *school use only*.

* Teachers may make changes to the plan, retaining alignment with the subject outline.
* The principal or delegate endorses the use of the plan, and any changes made to it, including use of an addendum.
* The plan does not need to be submitted to the SACE Board for approval.

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| School |  | Teacher(s) |  |

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| SACE school code | | |  | Year |  | Enrolment code | | | | |  | Program variant code (A–W) |
| Stage | Subject code | | | No. of credits (10 or 20) |
|  |  |  |  | **2** | **R** | **E** | **S** | **20** |  |

Addendum – changes made to the pre-approved learning and assessment plan

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| Describe any changes made to the pre-approved learning and assessment plan to support students to be successful in meeting the requirements of the subject. In your description, please explain:   * what changes have been made to the plan * the rationale for making the changes * whether these changes have been made for all students, or for individuals within the student group.   ***Example Context for Sample LAP:***  ***Stage 2 Electronics:***  *The course theme this year is “****Make it Move****” - exploring the application of electronic skills and knowledge in the field of robotics. Students have choice and agency to identify a need, develop and create solutions in the form of a product or system with respect to this guiding theme. Having a theme such as this is a good way to allow the student’s choice and flexibility within a reasonable scope of components that makes it practical for the teacher to manage the teaching and resources.*  *Themes could be selected with relation to the context of the school, local industry, contemporary themes, student heritage or aspirations. Other ideas for course themes include: Renewable Energy, Electronic Music, Household Robots, Unmanned Aerial Vehicles (UAVs), Remotely Operated Vehicles (ROVs), Robots for extra-terrestrial exploration, Automated (Smart) Homes, Internet of Things (IoT) online enabled devices, Environmental Sensing and Recording, and Automated Manufacturing.*  *This course is based upon the Arduino range of programmable open-source microcontrollers. These ideas could easily be adapted to use available resources such as other control systems including (but not limited to) Raspberry Pi SBC (single board computers), Picaxe microcontrollers, ESP8266 or WeMos controllers.* |

Endorsement

The use of the learning and assessment plan is approved for use in the school. Any changes made to the plan support student achievement of the performance standards and retain alignment with the subject outline.

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| Signature of principal or delegate |  | Date |  |

Assessment overview

**Stage 2 Robotic and Electronic Systems — 20-credits**

The table below provides details of the planned tasks and shows where students have the opportunity to provide evidence for each of the specific features of all of the assessment design criteria.

Assessment Type 1:Specialised Skills Tasks – 20%

| Assessment details | Assessment design criteria | | | | Assessment conditions  (e.g. task type, word length, time allocated, supervision) |
| --- | --- | --- | --- | --- | --- |
| I | D | P | E |
| **Specialised Skills Task 1: Ultrasonic Sensor**  Students will find produce a circuit that detects and an object and indicates the direction and distance of an object to the user. This will be used in a later project, an autonomous vehicle. It will be built with Arduino hardware and software, plus associated components. Indication can be achieved by using a LED, RGB LED, Buzzer or other output component, or a combination thereof.  Students will annotate their own code using the appropriate technical language making sure to explaining both how the code works and the hardware. They will submit a short video demonstrating the working circuit or demonstrate to the teacher in class. |  |  | P1 | E1 | Max 500 words.  Time allocation = 4 weeks of class time. |
| **Specialised Skills Task 2: LCD Keypad Scoring System**  Students will produce a circuit using a 2x16 LCD Display, with up to 5 programmable buttons connected to an Arduino. Students need to plan and program a system that uses one or more of the available buttons to modify a total that is displayed and updated onscreen. Students decide what should be counted by the system. For example it could be a football scoreboard, with buttons for goals and behinds for two teams.  Evidence of learning is demonstrated by submitting a short video (60 seconds) advertisement, where the full capabilities of the system are demonstrated. Students also submit their code file or screenshots of their code with comments or annotations to demonstrate understanding of commands. |  |  | P1, P2 | E1 | Demonstration video, maximum 3 minutes length.  Time allocation = 3 weeks of class time. |

Assessment Type 2: Design Process and Product – 50%

| Assessment details | Assessment design criteria | | | | Assessment conditions  (e.g. task type, word length, time allocated, supervision) |
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| I | D | P | E |
| Students identify an opportunity or need for a robot or device which they will create consistent with the course theme of:  “Make It Move”.  Examples include: Driving Robot, Bipedal Robot, Autonomous Vehicle or Load Shifting Robot (crane, forklift), Human Interaction Robot or XY Pen Plotter.  Students submit a comprehensive Design Folio which demonstrates evidence from all four areas of the Design and Realisation Process [see diagram on page 31 of Subject Outline].  Minimum Requirements:   * An Arduino- based circuit, built to perform a specific purpose as defined in the Design Folio. * Must have the ability to move. This means at least one motor. * Must have an Ultrasonic sensor. * Must have an ability to convey information, such as status, to the user. For example, a LCD screen, LED(s), Buzzer, etc. * Must operate in a safe manner, with respect to school workplace health and safety (WHS) regulations.   Design Folio sections:   1. Investigation and Analysis 2. Design Development and Planning 3. Solution Realisation (Production) 4. Evaluation   Regular checkpoints with deadlines will apply. The teacher will check progress and provide guidance via comments on printed or cloud-based documents.  Submission Format:  A digital portfolio is strongly encouraged to allow collection and annotation of artefacts and evidence over the extended duration of the project.  Example formats include: Powerpoint file, Word Document, OneNote Notebook, Webpage, Sway presentation, Moodle webpage, etc. Students are reminded that the format needs to be suitable for export or transmission via a USB disk for central moderation if required.  Please see the Subject Outline for further detail about this task. | IA1 | D1, D2 | P1, P2 | E1 | 3000 words total AT2 or up to 18 minutes if multimodal.  Time allocated = 18 weeks. |

Assessment Type 3: Resources Study – 30%

| Assessment details | Assessment design criteria | | | | Assessment conditions  (e.g. task type, word length, time allocated, supervision) |
| --- | --- | --- | --- | --- | --- |
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| EXTERNAL ASSESSED COMPONENT  **Part 1: Resource Investigation:**  **Motor Comparison and Selection**  Students investigate and analyse the functional characteristics and properties of two or more types of motor (or motor driving circuits) that they could use in their Product (AT2).  Examples include: Stepper versus Servo Motor, linear actuators, geared DC motors of different gearbox ratios. DC vs. Brushless 3 phase motors, etc.  Students plan and then conduct a range of purposeful testing that will produce both qualitative and quantitative results. These results should be tabulated and graphed where suitable. Conclusions and decisions about the suitability of motors can be drawn and articulated based on these results.  They report on how their research into and testing of the functional characteristics and properties of these materials or components will affect their selection for use in the realisation of their solution.  **Part 2: Issues exploration:**  **RADAR Technology**  This could focus upon different areas and applications of this technology, including weather RADAR, the historical role in warfare RADAR in World War II, modern RADAR technology, such as the JORN Over the Horizon RADAR in Alice Springs and others. Students will explain the principles and then one application of this technology.  Students choose one or more issues relating to the past, present or future use of this technology which they will investigate and analyse. Issues include: ethical, legal, economic and/or sustainability issues specific to their solution with respect to RADAR technology.  Students should adhere to Harvard Referencing conventions with a Reference List that correctly acknowledges a range of credible sources. | IA 1  IA2 | D2 |  | E1 | Maximum of 2,000 words total for AT3.  Students can decide the allocation of words to Part 1 and Part 2 ensuring that both have sufficient depth and rigor to effectively address the assessment criteria.  The Resource Study should be presented in written or multimodal form or a combination of both. It should be up to a maximum of 2000 words if written or the equivalent in multimodal form, where 1000 words is equivalent to 6 minutes.  Regardless of the format chosen, it must be suitable for export and transport via USB drive or printed for External Moderation.  Time allocation: Part 1 and Part 2 can be undertaken at the concurrently with other tasks, such as the AT1 Specialised Skills Tasks that are primarily practical in nature.  As such much of the work undertaken for these tasks will be during homework time, with minimal lesson time allocated.  Part 1 = 4 weeks lesson time.  Part 2 = 2 weeks. |

*Please refer to the Stage 2 Design, Technology, and Engineering subject outline.*