Software Engineering Stage 6 (Year 11) – sample assessment task 3 notification

Programming mechatronics

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# Task description

**Type of task**:blended mechatronics systems and object-oriented paradigm project.

**Outcomes being assessed**:

A student:

* describes methods used to plan, develop and engineer software solutions **SE-11-01**
* explains how structural elements are used to develop programming code **SE-11-02**
* describes how current hardware, software and emerging technologies influence the development of software engineering solutions **SE-11-03**
* applies tools and resources to design, develop, manage and evaluate software **SE-11-06**
* implements safe and secure programming solutions **SE-11-07**
* applies language structures to refine code **SE-11-08**
* manages and documents the development of a software project **SE-11-09**

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**Suggested weighting**: 40%

You are to plan a modified small mechatronic sensor and servo game using object-oriented programming techniques.

# Submission details

Students should submit a single document written report and design documentation in a word processed or PDF format containing the following components:

* a power, battery and material components list
* a wiring diagram
* a link to your online simulation
* a photograph of your physical mechatronic product
* a justification of the object-oriented programming techniques used.

# Steps to success

Table – assessment preparation schedule

|  |  |
| --- | --- |
| Steps | What I need to do/when I need to do it |
| Power, battery and material components | Create a complete power, battery and material components list for your physical mechatronic product. |
| Wiring diagram | Create a wiring diagram for your physical mechatronic product. Symbols used in the wiring diagram should match the ones provided in the Software Engineering course specifications. |
| Online simulation | Create an online simulation using object-oriented programming techniques. |
| Physical mechatronic product | Construct a physical mechatronic product that uses the same code as in your online simulation. |
| Justification of object-oriented programming techniques used | Identify and describe the object-oriented programming techniques used in your code and justify their use. Include the use of class diagrams where appropriate. |

# What is the teacher looking for?

This task will require students to plan and modify a small sensor and servo game.

To plan for the game’s production, a power, battery and material components list will be developed, and a wiring diagram will be produced.

Supplied code for the game should be modified to use object-oriented programming techniques. The same programming code for the game should be implemented in an online simulation, as well as in a physical mechatronic product.

The object-oriented programming techniques used in your code will be identified, described and their use justified with a written explanation.

# Marking guidelines

Table – assessment marking guidelines

|  |  |
| --- | --- |
| Grade | Marking guideline descriptors |
| A | * Demonstrates extensive knowledge of both OOP and mechatronic concepts. * Employs and strongly justifies the use of highly effective OOP techniques. * Creates a fully functional product, combining comprehensive mechatronic and OOP skills. |
| B | * Demonstrates thorough knowledge of both OOP and mechatronic concepts. * Employs and thoroughly justifies the use of a range of highly effective OOP techniques. * Creates a functional product, combining extensive mechatronic and OOP skills. |
| C | * Demonstrates sound knowledge of both OOP and mechatronic concepts. * Employs and soundly justifies the use of a range of OOP techniques. * Creates a product, combining sound mechatronic and OOP skills. |
| D | * Demonstrates basic knowledge of OOP and mechatronic concepts. * Employs and describes the use of OOP techniques. * Creates a product, combining basic mechatronic and OOP skills. |
| E | * Demonstrates some knowledge of OOP or mechatronic concepts. * Employs and identifies the use of limited OOP techniques. * Attempts the creation of a mechatronic product. |

The [Common Grade Scale for Preliminary Courses](https://www.educationstandards.nsw.edu.au/wps/portal/nesa/11-12/Understanding-the-curriculum/awarding-grades/monitoring-grades/common-grade-scale/!ut/p/z1/xVPLcoIwFP0WFywzuQkIuMQ-pD6qbaVKNk6MQbESEIK2_fqibWe6Udpx0ezu85yTnGCGp5gpvouXXMep4psqDpk9s-58ABNovzP2bfDaDx2_6wM1LRtPjg3UIzbxLdIbdlwC3nhIbNp16DBoYnaYJ7RDiEsH4FAHvMfR1ejav6XQb37Nw4njwe_mzzSw8_yfMcNMKJ3pFQ6z_UykSkulDcjydC2FRns5N0DJghtACCLUgFItZF5orhaxWiK9kkiUeR6LclMmBvA9z4-FZc4XsjAgSVWs0_xnSqRJlf0MUSH4Rh5YZCJe4JDTCFpgz5HbciSyWlETtWyToqhpujIiwrVd-a36tCx2_lInB7yad6vbEVYcnJMcehae7GK5x4FK86Ry0tMfJfq1CORChJr1zoXru3XWq_5WvN5umVcZ8OC6V42n_-jALAmCIHHNN_QSDW5MK-zu3tv3iIVeo_EBWSUHjA!!/dz/d5/L2dBISEvZ0FBIS9nQSEh/?urile=wcm%3Apath%3A%2Fpw_content%2Fproject-web%2Fnesa%2F11-12%2FUnderstanding-the-curriculum%2Fawarding-grades%2Fmonitoring-grades%2Fcommon-grade-scale) should be used to report student achievement.

# Student-facing rubric

Table – rubric for assessment

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Submission criteria | Limited | Basic | Sound | High | Outstanding |
| Power, battery and material components | Student identifies limited requirements for project. | Student identifies some of the of power, battery and/or material components. | Student identifies a list of power, battery and material components. | Student identifies a mostly complete list of power, battery and material components. | Student identifies a comprehensive list of power, battery and material components. |
| Wiring diagram | Student attempts a wiring diagram with symbols to represent components. | Student produces a wiring diagram using some correct symbols and conventions. | Student produces a partially accurate wiring diagram using some correct symbols and conventions. | Student produces a substantially accurate wiring diagram using mostly correct symbols and conventions. | Student produces an accurate and complete wiring diagram using correct symbols and conventions. |
| Online simulation | Student creates an online simulation with limited attempts at using OOP techniques. | Student creates an online simulation with some use of OOP techniques. | Student creates a working online simulation with substantial use of OOP techniques. | Student creates a working online simulation with extensive or effective use of OOP techniques. | Student creates a working online simulation with extensive and effective use of OOP techniques. |
| Physical mechatronic product | Student partially creates a physical product. | Student creates a partially complete, partially functioning, physical product. | Student creates a partially complete, partially functioning and safe physical product. | Student creates a substantially complete, functioning and safe physical product. | Student creates a comprehensive, complete, functioning and safe physical product. |
| Justification of object-oriented programming techniques used | Student identifies OOP techniques used. | Student describes an OOP technique used. | Student describes and explains a range of OOP techniques. | Student provides a strong justification of the use of a range of OOP techniques. | Student provides a strong justification of the use of an extensive and effective range of OOP techniques. |

# Student support material

Resources include:

* Teacher support resource for Programming mechatronics
* this resource provides an implementation guide of a small sensor and servo game
* [Software Engineering Syllabus](https://curriculum.nsw.edu.au/learning-areas/tas/software-engineering-11-12-2022/overview)
* [Higher School Certificate: Course Specifications – Software Engineering (PDF 2.9 MB)](https://library.curriculum.nsw.edu.au/341419dc-8ec2-0289-7225-6db7f2d751ef/94e1eb0a-0df7-4dbe-9b72-5d5e0d17143a/software-engineering-11-12-higher-school-certificate-course-specifications.PDF)
* [Software Engineering Glossary](https://curriculum.nsw.edu.au/learning-areas/tas/software-engineering-11-12-2022/glossary).

# Additional information

This resource has been developed to assist teachers in NSW Department of Education schools to create learning that is contextualised to their classroom. It can be used as a basis for the teacher’s own program, assessment, or scope and sequence, or be used as an example of how the new curriculum could be implemented. The resource should be used with timeframes that are created by the teacher to meet the overall schedules of assessment.

For additional support or advice, contact the TAS curriculum team by emailing [TAS@det.nsw.edu.au](mailto:TAS@det.nsw.edu.au).

## Assessment advice

Assessment is a powerful tool to measure student learning and plan for the next stages in the learning process. Some considerations in using parts of this assessment notification are:

* Consider the skills, knowledge, and understanding students need to complete the task, and see where there are opportunities for them to refine these through ongoing feedback in the learning sequences associated with the assessment task.
* Ensure the language and readability of the task presents an appropriate challenge for the students the task is being used with. Direct, plain English will allow the greatest number of students to access the task independently.
* Marking guidelines should directly reflect the success criteria and outcomes of the task and align with appropriate levels of achievement for the relevant stage.
* When constructing or adjusting the marking guidelines and/or rubric, try to keep active verbs like ‘do’, ‘say’, ‘make’, or ‘write’ in mind to measure student performance at each level. This will help to avoid subjective language.

## Assessment as a learning opportunity

Assessment can provide ways for students to use formal and informal feedback and self-assessment to help them understand where they are in their learning, where they are going, and how they are going to get there. It is essential that students receive feedback on their performance in the task and have opportunity to clarify and plan the next steps in learning.

* Clear and explicit marking rubrics can support effective self-assessment in relation to the learning intentions and success criteria assisting students to become owners of their own learning. Students can then build their capacity for individual goal setting, which includes students asking questions such as, ‘What do I need to improve?’ and ‘What is my next step?’ ([CESE Growth goal setting – what works best in practice](https://education.nsw.gov.au/about-us/education-data-and-research/cese/publications/practical-guides-for-educators/growth-goal-setting)).
* Greater learning gains may be made when teachers provide explicit descriptive feedback to students in a timely manner. This feedback supports students in forming their learning goals as well as helping the teacher to plan for the next iteration of the teaching and learning cycle.

## Differentiation advice

Differentiated learning can be enabled by differentiating the assessment approach to content, process and product. Reasonable adjustments of assessment for students with disability is a legal requirement under the [Disability Standards for Education 2005 (Cth)](https://www.education.gov.au/disability-standards-education-2005). For students with a disability, adjustment in assessment tasks should be made through the [Collaborative curriculum planning](https://educationstandards.nsw.edu.au/wps/portal/nesa/k-10/diversity-in-learning/special-education/collaborative-curriculum-planning) process. For more information on differentiation, go to [Differentiating learning](https://education.nsw.gov.au/teaching-and-learning/professional-learning/teacher-quality-and-accreditation/strong-start-great-teachers/refining-practice/differentiating-learning) and [Differentiation](https://education.nsw.gov.au/campaigns/inclusive-practice-hub/primary-school/teaching-strategies/differentiation). When using this resource, teachers can use a range of [adjustments](https://education.nsw.gov.au/teaching-and-learning/disability-learning-and-support/personalised-support-for-learning/adjustments-to-teaching-and-learning) to ensure a personalised approach to student learning.

* Some common adjustments are available through the [inclusive practice hub assessment and reporting](https://education.nsw.gov.au/campaigns/inclusive-practice-hub/all-resources/secondary-resources/other-pdf-resources/nesa-assessment-and-reporting) site.
* The [HPGE Differentiation Adjustment Tool](https://education.nsw.gov.au/teaching-and-learning/high-potential-and-gifted-education/supporting-educators/implement/differentiation-adjustment-strategies) and [Differentiation Package](https://schoolsnsw.sharepoint.com/sites/HPGEHub/SitePages/Home.aspx#first-time-access-to-hpge-resources) can assist teachers to decide how to provide extension and additional challenge for High Potential and Gifted (HPG) students.

The steps below may be useful to consider when creating access opportunities for all students:

* remove unnecessary words/images
* simplify any tricky words, or make a glossary of subject-specific words
* reduce the lexical density of the steps and use student-friendly language
* chunk large passages of reading or offer alternate ways of representing the information, such as a visual
* make the task description a checklist with numbered steps
* limit options and/or reduce the number of choices students need to make independently.

## Support and alignment

**Resource evaluation and support**: all curriculum resources are prepared through a rigorous process. Resources are periodically reviewed as part of our ongoing evaluation plan to ensure currency, relevance and effectiveness. For additional support or advice, contact the TAS curriculum team by emailing [TAS@det.nsw.edu.au](mailto:TAS@det.nsw.edu.au).

**Alignment to system priorities and/or needs**: [School Excellence Policy](https://education.nsw.gov.au/policy-library/policies/pd-2016-0468)

**Alignment to the School Excellence Framework**: this resource supports the [School Excellence Framework](https://education.nsw.gov.au/policy-library/policies/pd-2016-0468) element of assessment (formative assessment, summative assessment, student engagement).

**Alignment to Australian Professional Teaching Standards**: this resource supports teachers to address [Australian Professional Teaching Standards](https://educationstandards.nsw.edu.au/wps/portal/nesa/teacher-accreditation/meeting-requirements/the-standards/proficient-teacher) 5.1.2, 5.4.2.

**Consulted with**: Curriculum and Reform, Inclusive Education, Multicultural Education, Aboriginal Outcomes and Partnerships and subject matter experts

**NSW Syllabus**: Software Engineering 11–12

**Syllabus outcomes**: SE-11-01, SE-11-02, SE-11-03, SE-11-06, SE-11-07, SE-11-08, SE-11-09

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**Resource**: Assessment task notification

**Related resources**: further resources to support Software Engineering 11–12 can be found on the [TAS curriculum page](https://education.nsw.gov.au/teaching-and-learning/curriculum/tas).

**Professional learning**: relevant professional learning is available through [HSC Professional Learning](https://education.nsw.gov.au/teaching-and-learning/professional-learning/hsc-pl) or on the [TAS Statewide staffroom](https://teams.microsoft.com/l/channel/19%3Ac4aa94ee6a3340e3b35ca2f2c40375df%40thread.tacv2/NEW%20Stage%206%20-%20Software%20Engineering%2011-12?groupId=cd5a04e1-7742-47dd-b141-9519486d9e00&tenantId=05a0e69a-418a-47c1-9c25-9387261bf991).

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# Evidence base

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