ST. PATRICK’S COLLEGE SILVERSTREAM



Design and Mechanical Technologies

2017

Technology Achievement Standards

Course Handbook



This book with be used throughout the course as a source of information and as a record of the projects and learning activities during the year.

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| Student’s Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Teacher -  |

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# Rules of authenticity.

An Assessment schedule for each Achievement standard will be shared with you in a google folder. You will not have editing rights as this is your marking schedule. This will give you the opportunity to view feedback from your teacher once milestone dates have been set.

The external achievement standard will be assessed by an external marker at the end of the year.

Due to the project based nature of this course and the length of time assigned: **THERE WILL BE NO FURTHER ASSESSMENT OPPORTUNITIES.**

You can gain the following grades in the achievement standards:

N - Not achieved A - achieved M - merit E - excellence

Students are required to verify the sighting and acceptance of the grade awarded by signing the result sheet once grades have been recorded on the schools computer system.

**STUDENT RESPONSIBILITIES**

YOU are responsible for:

* Reading this statement and being aware of assessment standards and dates
* Retaining materials required for assessment
* Checking and signing your achievement and unit standard results
* Questioning any perceived injustice in your results WITHIN TWO WEEKS
* Checking the accuracy and detail of your enrolment of standards on the NZQA website
* Meeting deadlines for completed assessments

**BREACHES OF RULES**

* You may be asked to declare that all work submitted for internal assessment reflects your own effort and ability. **Authenticity statements must be signed by students declaring this is their own work**. Teachers have the right to check authenticity by means such as an oral test or in class demonstration of skills. Failure to show familiarity with, or understanding of concepts contained in out-of-class assignments could affect the decision made. Clearly plagiarised work will result in a not achieved grade. Students who allow others to copy their work also get a not achieved grade.

Supporting evidence is preferred as a Google Document shared with Ms Curran on or before the due date.

It is the ***student’s responsibility*** to ensure a backup of their work is kept current and stored externally to their device. This can be done in a variety of different ways. I save a separate copy of the Google Doc on my hard drive as a backup.

# Assessment Information

The Level 1 course is made up of both internal and external assessments. The credits contribute towards NCEA and are applicable for University Entrance. *There are several Achievement Standards to offer however the new school policy is to only offer 14 credits at level 1.*

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| --- | --- | --- | --- | --- | --- | --- |
| **Level**  | **Ver** | **Title** | **Credits** | **Assess-ment** | **Literacy** | **Numeracy** |
|  |  |  |  |  |  |  |
| [91048](http://www.nzqa.govt.nz/ncea/assessment/search.do?query=91349&view=all&level=01) | 3 | Demonstrate understanding of how technological modelling supports decision making | 4 | **External** | YES | - |
| 91047 | 3 | Undertake development to make a prototype to address brief | 6 | Internal | - | - |
| 91044 | 3 | Undertake brief development to address a need or opportunity | 4 |  | - | - |
|  |  | **TOTAL AVAILABLE CREDITS** | **14**  |  |  |  |

Optional, for students who wish to focus on materials their properties (91059) and the quality of their build (91057).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Level 2** | **Ver** | **Title** | **Credits** | **Assess-ment** | **Literacy** | **Numeracy** |
| 91059 | 3 | Demonstrate understanding of basic concepts used to make products from resistant materials | 4 | Internal |  | - |
| 91057 | 3 | Implement basic procedures using resistant materials to make a specified product | 6 | Internal |  |  |

# A breakdown of each Achievement Standard

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| --- |
| **991044 “Brief Development”**This achievement standard involves undertaking brief development to address a need or opportunity. Through developing your own brief this gives you the opportunity to develop your own project. Stakeholders must be accessible to students. Moderators are looking for stakeholder feedback throughout this process.Please view the marking schedule to realise what is required.You will start with an initial brief and as you work through your functional modelling and prototyping you may find the need to make alterations to your brief prior to writing your final brief. Your final brief should include material specifications and working drawings.It is intended that students will explore a given context and issue in order to identify a need or opportunity, and undertake a process of brief development resulting in the communication of the nature of an outcome that resolves a need or opportunity. Stakeholders must be accessible to students.A *need* refers to an identified requirement related to a person, group or environment (social and physical).An *opportunity* refers to an identified possibility related to a person, group or environment (social and physical).An outcome for the purpose of this achievement standard is a conceptual design for an outcome and/or a technological outcome itself (prototype).* *Initial brief*
* *Testing and trialling / functional modelling and prototyping to inform decisions*
* *Ongoing stakeholder feedback*
* *writing final brief*
* *material specifications and final working drawings*
 |
| **AS 91048 “Technological Modelling”.** This is a written report that you can start gathering evidence for from the beginning of the year once you have decided on an initial brief. Most of your evidence will be derived from work you are doing towards your project, in particular during the functional modelling and prototyping of your project.**To pass this standard you will be expected to either build a model as part of your project OR research examples of how modelling is used in other case studies from industry.**See the Assessment Schedule for what you need to include in your evidence for this standard.This is an **externally assessed** standard which must be submitted in the form of a written report. Students will learn about aspects of modelling relevant to their project, but should also expect to demonstrate how modelling is used in other industry areas.* *Ongoing testing and trialling performed to inform decision making throughout the design process.*
* *Ongoing note taking explaining why you have made certain decisions.*
* *Final written report no more than 14 pages due upon completion.*
 |
| **AS91047 “Develop a Prototype”.** This Achievement standard is suited to students who wish to design their own product, produce their own technological outcome. This is the process of designing, testing and trialling. Through functional modelling you will make decisions on what to do next, making notes and explaining why you have made the decisions on what ‘could happen’ vs what ‘should happen’. You will trial materials and components to select the best ones for your design, select tools and equipment to use, make your prototype, test it in situ and evaluate its fitness for purpose.You will need to develop your own brief prior to embarking on this achievement standard, however as you work through your functional modelling and prototyping you may find the need to make alterations to your brief. See the Assessment Schedule for what you need to include in your evidence for this standard.* *Initial project brief agreed between teacher and student.*
* *Functional modelling carried out to inform decisions.*
* *Model of proposed design including mechanical sketches and details of electronics/software if required.*
* *Final design fabricated.*
* *Final design fully functional and built, tested in situ end of term 3. Evaluation carried out and submitted with prototype.*
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| **91057 “Implement basic procedure”**This standard is to build something to a high quality. This is a practical standard and you will be judged on your ability to operate within a workshop. You will be judged on your ability to meet a deadline, accuracy of all marking out, cutting and final technological outcome. Your ability to follow instructions and perform independently within the workshop demonstrating safe practice will also be judged. The integration of parts is very important in this Achievement Standard. The use of hot glue to join componentry is considered a not achieved for this particular standard.See the Assessment Schedule for what you need to include in your evidence for this standard. |

# Project 1: Sumo-bot junior.

In the first part of the year we will be using a microcontroller to build a junior sumobot.



You will print laser files and assemble.

This will give you a good introduction to connecting the motors and sensors to the Arduino and assembling Arduino code.

Dependant on your outcome of this project you may choose to be assessed on this project using the 91057 implement procedures achievement standard.

This will be a valuable learning exercise and will help you to develop your own project

# Project 2: Design and build an Arduino controlled toy.

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| *Brief* *Conceptual statement:**Arduinos are low-cost microprocessors which have a huge range of functions in a small package. They can be used to control quite high-power motors by using a plug-in motor-shield. Many robotic enthusiasts are using arduinos to build a whole range of useful and interesting devices. Your task is to design and construct a useful Arduino-based device that does something useful in your everyday life.**Specifications* *Must use an Arduino microcontroller**Must have at least one motor**Must have at least one sensor**Must be original by design**Must take physical size constraints into account**Parts requests must be placed on time. Max price negotiable with teacher. Expensive components may have to be purchased at student’s own cost.* |

*As you attempt each different Achievement Standard, be aware of the assessment criteria in the assessment schedule. These have been taken directly from the Achievement Standard.*

*Ask for help if there is anything you do not understand about what is required for submission.*

# Recourses, references and restrictions:

# Exemplars (Level 1)

Exemplars are examples of student work that have been marked and moderated.

**Level 1 Exemplars**

91044: develop a brief

<http://www.nzqa.govt.nz/assets/qualifications-and-standards/qualifications/ncea/NCEA-subject-resources/Technology/91044/91044-EXP.pdf>

91048 – Technological modelling

<http://www.nzqa.govt.nz/qualifications-standards/qualifications/ncea/subjects/technology/external-exemplars/>

91047 – Develop a prototype

<http://www.nzqa.govt.nz/assets/qualifications-and-standards/qualifications/ncea/NCEA-subject-resources/Technology/91047/91047-EXP.pdf>

91057 – Implement basic procedures using resistant materials

<http://www.nzqa.govt.nz/assets/qualifications-and-standards/qualifications/ncea/NCEA-subject-resources/Technology/91057/91057-EXP-_2.pdf>

**Report Writing Specifications:**

**NZQA Assessment specifications:** [**Click Here**](http://www.nzqa.govt.nz/nqfdocs/ncea-resource/specifications/2014/level2/91358-spc-2014.pdf)

**Use the above Web link for the latest official specs from NZQA.**

**The “modelling” report is externally assessed.**

**I can give you formative feedback only.**

**In the end it will be marked by an anonymous external marker.**

**You will not receive your mark until January 2018.**

**It is possible for a four page report gain merit.**

**It is also possible for a fourteen page report to gain achieved.**

**Follow the Assessment Schedule.**

**Somewhere between six and ten pages of well documented, original work will be enough for excellence.**

**Have someone proof-read it before submitting it to me for Formative Assessment.**

# Computer Software

Computers are available in the Technology Department and in the Computer department at school. It would be helpful if students had their own computers, either a laptop or a home desktop.

A minimum of 4GB (ideally 8GB) of memory is required to run Autodesk Inventor.

The course will be based around using Arduino boards to control motors and sensors.

# Google Drive & Google Classroom

The school is now using Gmail and Google Drive for all students. You will need to check your Gmail account regularly for email updates from me.

All reports should be submitted via Google Drive (create a Google Doc and then share it with me (curranb@stream.school.nz). I will provide feedback to you via comments in the document which you should use to help you improve.

I have created a Google Docs folder which will be used to store useful resources for this source. This folder should be your first point of reference.

# Arduino

The following are Web links to [www.arduino.cc](http://www.arduino.cc)

The open-source Arduino Software IDE) can be downloaded from this page by going to download…Previous Releases…Arduino 1.0.6 Please note that this is NOT the latest version. (I found that Ardublock is not compatible with the latest version, so we need to stick with the classic Arduino ISE

Also on the Arduino webpage you will see a link to “Learning”. This is an excellent place to start. There are examples and descriptions to help you.

# Autodesk Inventor

The school has a licence for Autodesk Inventor Software. It is a professional solid modelling package. Please speak to Mr Wilson if you would like to download and install this software on your computer.

The Inventor program itself has tutorial videos built in. The Autodesk website also has [tutorials](http://knowledge.autodesk.com/support/inventor-products/getting-started#?sort=score):

There are also many other tutorials available, including [this one](https://www.youtube.com/watch?v=lEheFEer5Is):

# Component Sourcing & Pricing

**Most of the components I buy in are from either Surplustronics or Electroflash.**

**We have a good discount structure established.**

**When pricing components, use the 1-10 price.**

**This will give you an accurate figure to work with, although it may cost less if I order more than just for your project.**

[**www.surplustronics.co.nz**](http://www.surplustronics.co.nz)

**www.electroflash.co.nz**

**Other sources:**

[**www.nicegear.co.nz**](http://www.nicegear.co.nz)

[**www.jaycar.co.nz**](http://www.jaycar.co.nz)

**www.pololu.com**

[**www.hobbyking.com**](http://www.hobbyking.com)

[**www.trademe.co.nz**](http://www.trademe.co.nz)

[**www.ebay.com**](http://www.ebay.com)

# Level One Achievement Standards

Achievement Standard AS91044 Undertake brief development to address a need or opportunity

Internal, 4 credits

Introduction

This achievement standard involves undertaking brief development to address a student identified need or opportunity.

 *Undertake brief development to address a need or opportunity* involves:

* identifying a need or opportunity as a result of exploring the given context and issue
* reflecting consideration of the social and physical environment
* reflecting key stakeholder’s opinion
* describing the outcome to be developed
* identifying the physical and functional attributes needed for the outcome
* Producing a final brief comprised of a conceptual statement and specifications.

Merit: All of the above +

*Undertake detailed brief development to address a need or opportunity* involves:

* explaining how the need or opportunity is derived from the issue
* reflecting iterative consideration of the social and physical environment and key stakeholder’s opinion
* describing the purpose of the outcome, within the intended environment
* Explaining the physical and functional attributes needed for the outcome.

Excellence: All of the above +

*Undertake comprehensive brief development to address a need or opportunity* involves:

* justifying why such an outcome should be developed
* Justifying why the identified physical and functional attributes are needed for the outcome.

Achievement Standard AS91057 Implement basic procedures using resistant materials to make a specified product

Internal, 6 credits

Introduction

This achievement involves making something really well! It needs to meet specifications, be completed on time and with as little waste of materials as possible. The reason we are doing this particular achievement standard is to learn how to build something properly. How to use the machines in the workshop, know how to change fixed machinery to the appropriate speed and operate safely within a workshop. If you wish to continue with this particular AS through to level 3 then you will eventually need to be able to integrate materials at a complex level. If you have an interest in using the lathe/milling machine and or building something that has structural integrity then this is the standard you will want to maintain over the next three years.

1. Techniques include:
* one or more of measuring/marking out
* one or more of sizing/shaping/forming
* one or more of joining/assembling
* One or more of finishing/detailing/tuning.
1. Tests may include but are not limited to – measurement of tolerances, performance testing, fitting, visual checks.

Achieved

*Implement basic procedures* *using resistant* *materials to make a* *specified product* involves:

* following a set of techniques to make a product that meets specifications
* undertaking a range of appropriate tests to demonstrate the product meets specifications
* Applying techniques that comply with relevant health and safety regulations.

Merit

*Skilfully implement basic procedures* *using resistant* *materials to make a specified* *product* involves:

* all of the above and:
* Showing independence and accuracy in the execution of the techniques and tests.

Excellence

*Efficiently implement basic procedures using resistant* *materials to make a specified* *product* involves:

* all of the above and:
* Undertaking techniques and tests in a manner that economises time, effort and materials.

Evidence you must submit for this achievement standard must include:

* Your completed sumo bot???
* Photographic evidence of the steps you have taken to meet all the criteria.
* written notes to describe the steps you have taken
* Observation by Ms Curran of your ability to work in the workshop.

Please refer to the full achievement standard document, for full details.

Achievement Standard 91048 – Demonstrate understanding of how technological modelling supports decision making

External, 4 credits

Introduction

This achievement standard requires you to submit a written report showing that you understand how modelling is used to support decision making.

Technological modelling is the testing of design ideas to see if they can contribute to a fit-for-purpose technological outcome.

* Functional modelling is the ongoing testing of design concepts
* Prototyping is the realisation of a fully functioning model

**Technological modelling involves two kinds of reasoning:**

* Functional reasoning – how to make it happen, how it is happening
* Practical reasoning – should we make it happen? Should it be happening?

Modelling can refer to both functional modelling and practical reasoning:

**Functional modelling** can include detailed sketches, functional models made from materials such as cardboard, MDF, or plastic. It can also refer to CAD models. Functional modelling helps us work out how to make something, such as testing various types of materials to decide which material to use.

**Practical reasoning** focuses on knowing what is justifiable in social and ethical terms and is based on what “should” or “ought” to be done. It is the normative element of technology and reflects the social and cultural morals and ethics of technology

Evidence you must submit for this achievement standard must include:

* Specifications recommended: Report writing Technological modelling.
* Font = Ariel 12.
* YOU MUST HAVE A 25MM MARGIN AROUND THE WHOLE PAGE.
* No more than 10 single sided A4 pages.
* If you wish to submit video footage it must be compatible with WINDOWS MEDIA PLAYER and be no longer than 1.5 minutes.
* Your NSN number must appear on the top left hand corner with the Achievement Standard number: AS 91048

***Achieved:***

*Demonstrate understanding of* *how technological modelling supports decision‑making* involves:

* identifying the technological modelling undertaken to develop and trial a technological outcome
* identifying evidence derived from technological modelling
* Describing how the evidence gained informed decisions about ‘what could happen’ and ‘what should happen’ for the technological outcome.

***Merit:***

*Demonstrate in-depth understanding of* *how technological modelling supports decision-making* involves:

* explaining the purpose of the technological modelling undertaken to develop and trial a technological outcome
* Explaining why the evidence gained enabled decisions to be made about ‘what could happen’ and ‘what should happen’ for the technological outcome.

***Excellence:***

*Demonstrate comprehensive understanding of* *how technological modelling supports decision-making* involves:

* discussing how decisions made about a technological outcome considered ‘what could happen’ and ‘what should happen’
* Discussing how technological modelling identifies risk to support decision making.

*Technological modelling* refers to both functional modelling and prototyping. Your technological modelling is relative to the prototype you are building.

Please refer to the full achievement standard document, for full details.

What is technological modelling?

Source: <http://technology.tki.org.nz/Technology-in-the-NZC/Technological-knowledge/Technological-modelling>

What is the difference between functional modelling and prototyping?

**Functional modelling**

* Allows for ongoing testing of design concepts for unfinished technological outcomes:
* Is about testing and trailing of different ideas
* Is a tool to support predictions about possible future impacts?
* Takes into account specifications, materials, techniques, suitability, and historical, socio-cultural factors.
* Test parts of a design as well as complete conceptual design.

**Prototyping.**

* Allows for the evaluation of the fitness for purpose of the technological outcome
* Is the first finished outcome. It is tested in the social and physical environment.
* Helps to determine the fitness for purpose in the broadest sense.
* Seeks to gather information on its acceptability in implementation or the need for further development.
* Allows for testing against impacts on people, physical, social environment in which it will be situated.

Source: [https://technologynz.wikispaces.com/Technological+modelling](https://technologynz.wikispaces.com/Technological%2Bmodelling)

Achievement Standard 91047 - Undertake effective development to make and trial a prototype

Internal, 6 credits

Introduction

This assessment activity requires you to respond to a given brief or one that you have developed, by selecting and using resources to make a prototype, and then evaluating the prototype to determine its ‘fitness for purpose’ within the physical and social environment stated in the brief.

A prototype is a finished outcome that is ready to be trialled in its intended location (environment).

Fitness for purpose refers to the outcome’s ability to address its brief when situated in its intended location.

This is an individual assessment task. You have twenty weeks of in-class and homework time to complete this task

Task

Research and trialling

In response to the brief (either your own or given by the teacher) for an Arduino controlled toy device, you will need to:

* Trial materials and/or components in order to select those that best fit the purpose of the outcome. For example: testing different materials and their construction to find out which is the strongest and most durable material to use in your prototype; comparing a range of materials and deciding on the most suitable for your prototype and for the person using it in the intended environment.
* select tools and equipment used in process
* trial and select techniques and processes, *for example, testing different methods to see which is the most appropriate to use for the design of the device and the materials selected for use in order to ensure fitness for purpose*
* Refine your specifications as a result of your informed selections.

***Making your Prototype***

* Use the materials, components, tools and equipment already selected to make your prototype to address your brief.
* Use tools and equipment following accepted safe practices
* Consult with your stakeholders to gain opinion on the developing prototype

***Evaluating “Fitness for purpose”***

Having completed yourArduino controlled device (prototype) you will need to evaluate its fitness for purpose against the final brief. This means you will have to trial your solution to test its ability to meet the physical and functional requirements for those using the prototype and its suitability within its intended physical and social environment.

The physical environment refers to the place where the final outcome will be situated. The social environment refers to those who will interact with the final outcome.

You will need to provide evidence about how well yourArduino device meets the specifications of the final brief. It is important to gather stakeholder feedback to make these judgements.

**Glossary**

**Glossary of Technology terms with A–Z navigation**

[A](http://technology.tki.org.nz/Glossary#A) is for Actuator

[B](http://technology.tki.org.nz/Glossary#B) is for Bearing

[C](http://technology.tki.org.nz/Glossary#C) is for Components

[D](http://technology.tki.org.nz/Glossary#D) is for Digital

[E](http://technology.tki.org.nz/Glossary#E) is for embedded systems

[F](http://technology.tki.org.nz/Glossary#F) is for Feedback

[G](http://technology.tki.org.nz/Glossary#G) is for Google Docs

[H](http://technology.tki.org.nz/Glossary#H) is for H Bridge

[I](http://technology.tki.org.nz/Glossary#I) is for Iterative

[J](http://technology.tki.org.nz/Glossary#J) is for Justify

[K](http://technology.tki.org.nz/Glossary#K) is for Key Switch

[L](http://technology.tki.org.nz/Glossary#L) is for LED

[M](http://technology.tki.org.nz/Glossary#M) is for Microprocessor

[N](http://technology.tki.org.nz/Glossary#N) is for Need

[O](http://technology.tki.org.nz/Glossary#O) is for Outcome

[P](http://technology.tki.org.nz/Glossary#P) is for Program

[Q](http://technology.tki.org.nz/Glossary#Q) is for Quality Control

[R](http://technology.tki.org.nz/Glossary#R) is for Robotics

[S](http://technology.tki.org.nz/Glossary#S) is for Sensor

[T](http://technology.tki.org.nz/Glossary#T) is for Technical drawing

[U](http://technology.tki.org.nz/Glossary#U) is for Usability

[V](http://technology.tki.org.nz/Glossary#V) is for Visual communication

[W](http://technology.tki.org.nz/Glossary#W) is for Wire

[X](http://technology.tki.org.nz/Glossary#X) is for Extremely interesting

[Y](http://technology.tki.org.nz/Glossary#Y) is for YouTube, the home of all information!

[Z](http://technology.tki.org.nz/Glossary#Y) is dead

**The above links to the Technology glossary provided by TKI (a NZ Ministry of Education funded resource provider)**

[**http://technology.tki.org.nz/Glossary#glossary\_31920**](http://technology.tki.org.nz/Glossary#glossary_31920)**, this is the glossary provided by the ministry of education. Any words you are unsure of in the achievement standards please use this link to garner clarification.**

**External links to more extensive glossaries:**

[**http://www.nwscc.edu/nsfdc/technology/DCTermspage.htm**](http://www.nwscc.edu/nsfdc/technology/DCTermspage.htm)[**http://www.zytrax.com/tech/glossary/gloss.htm**](http://www.zytrax.com/tech/glossary/gloss.htm)

[**http://www.hobbyprojects.com/dictionary/a.html**](http://www.hobbyprojects.com/dictionary/a.html)[**http://whatis.techtarget.com/glossary/Electronics**](http://whatis.techtarget.com/glossary/Electronics)