SCHOOL OF ELECTRICAL ENGINEERING AND COMPUTING

PROJECT RISK ASSESSMENT

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

Rev. 0.7 18/02/2022

Assessors Name[1]:	Ysobel Sims		Date:	18/02/2022
Assessors Email Address:	ysobel.sims@uon.edu.au			
Project Supervisor:	Stephan Chalup			

Project Details

Project Title:	NUbots
Project Location:	ES115A
Brief Description:	

Project Participants[2]	Name	Type (staff/student/visitor)	Date
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			

[1] The Assessor should be the primary participant in the project.

[2] Project Participants are anybody who will work on hardware associated with this project. This does not need to include members of the technical staff unless the technical staff member is an active member of the project team.

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Please complete the table below identifying any standard laboratory equipment that will be used to complete your project.

Standard Laboratory Equipment and Usage		
Soldering Iron	Used:	Please ensure project participants are aware of potential safety hazards associated with soldering detailed on our Online Safety Manual (http://www.eng.newcastle.edu.au/eecs/ect/oh&s/Hazards/Soldering.html).
Heat Gun	Used:	Please ensure project participants are aware of potential safety hazards associated with using a Heat Gun detailed on our Online Safety Manual (http://www.eng.newcastle.edu.au/eecs/ect/oh&s/Hazards/HeatGun.html).

Please list in the table below equipment that will be used to complete your project.

Equipment Description
DARWIN OP HUMANOID ROBOTS
IGUS OP HUMANOID ROBOTS
LAPTOP/DESKTOP PCs
LIPO BATTERIES
SCREWDRIVERs, VICE GRIPS, PLIERS, WIRE CUTTERS, BOX CUTTERS, CRIMP TOOL, CLAMP
SOLDERING IRON
MOTION CAPTURE EQUIPMENT
VR HEADSET, AR HEADSET

Before commencing a project all members of the project team who will be working on hardware must comply with the School's WHS requirements, these are:

Staff: **complete a Lab Induction.**
Students: **complete a Lab Induction and the Laboratory Access Quiz.**

NB. Students must complete the Laboratory Access Quiz regardless of where work will be performed on the project.

The questions posed in this document are provided to help guide you through the Risk Assessment process. You should answer all the relevant questions in this document.

For assistance with this process refer to:

1. the WorkCover publication "Risk Management at Work", this can be found at: http://www.eng.newcastle.edu.au/eecs/ect/oh&s/pdf/risk_management_at_work_guide_0425.pdf
2. the University also has a comprehensive Risk Analysis web site, this can be found at: http://www.newcastle.edu.au/current-staff/working-here/work-health-and-safety/managing-health-and-safety-risks

Section 1 Work to be performed on site (i.e. EE/ES Laboratories) or at Home, etc.

This section is to be completed for all projects. When completing this, you must consider all the places where work will be performed on this project.

	General EE Safety Requirements The following questions have been included to ensure that you have complied with the Discipline's minimum WHS criteria.		
1.1	Have all the project team members completed the Discipline of Electrical and Computer Engineering's Lab Induction?	☐ Yes, go to 1.2	☐ No, then do it
1.2	Have all project team members completed the Nubots Lab Induction form?	☐ Yes, go to 1.3	☐ No, then do it
1.3	Are any of the project team members students?	☐ Yes, go to 1.4	☐ No, go to 1.8
1.4	Will any of the project team members be working alone in any of the EE/ES Laboratories to complete the project?	☐ Yes, go to 1.5	☐ No, go to 1.10
1.5	Address this aspect specifically in the ***Additional Hazard Identification and Assessment*** section of this document.		▪ go to 1.6

	Electrical Hazards The following questions are meant purely as a guide. As this is a generic guide the questions cannot cover every hazard that you may encounter during your project.		
1.6	Are you doing any hardware prototyping, i.e. building and testing electronic circuit?	☐ Yes, go to 1.7	☐ No, go to 1.9
1.7	If you are using a mains powered Power Supply, are you protected by an RCD?	☐ Yes, go to 1.8	☐ No, go to 1.8
1.8	Document in the ***Additional Hazard Identification and Assessment*** section of this document the severity, likely hood and priority of this hazard and what controls you will implement to minimise the Risk.		▪ go to 1.9

1.9	Are you intending to use an Earth Isolated GPO for any reason?	☐ Yes, go to 1.10	☐ No, go to 1.11
1.10	Document in the ***Additional Hazard Identification and Assessment*** section of this document the severity, likely hood and priority of this hazard and what controls you will implement to minimise the Risk.		▪ go to 1.11
1.11	Will you be working with any exposed conductors?	☐ Yes, go to 1.12	☐ No, go to 1.13
1.12	Document in the ***Additional Hazard Identification and Assessment*** section of this document the severity, likely hood and priority of this hazard and what controls you will implement to minimise the Risk.		▪ go to 1.13
1.13	Will you be working with any differential potentials greater than "extra low voltages" as prescribed in AS/NZS3000, i.e. $50V_{ac}$ and $120V_{DC}$?	☐ Yes, go to 1.14	☐ No, go to 1.15
1.14	To do this you will need to specifically address the issue in the ***Additional Hazard Identification and Assessment*** section. Is it possible to have a colleague present during this work? Can you demonstrate suitable experience of this type of work? Do you need a specific induction relating to this type of work? NB. if you are provided with a specific induction, this induction must be fully documented and signed by your academic supervisor.		▪ go to 1.15
1.15	Does your project involve connecting any sensors to human body?	☐ Yes, go to 1.16	☐ No, go to 1.17
1.16	Connecting sensors to the human body, e.g. any electrically operated biomedical device, requires extreme care. As a minimum you should consult the Australian Standards AS/NZS 25005 and AS/NZS 3200.1.0:1998. You should document in the ***Additional Hazard Identification and Assessment*** section of this document the severity, likely hood and priority of any identified hazard and what controls you will implement to minimise the Risk. **NB. 1. never connect electrical sensors to the human body without first having your design and equipment configuration approved by your project supervisor.** **2. before using another person as a subject in any testing you need to make sure you comply with the University's ethic's policy.**		▪ go to 1.17

1.17	Are there any other electrical hazards associated with your project?	☐ Yes, go to 1.18	☐ No, go to 1.19
1.18	Document each hazard you can identify in the ***Additional Hazard Identification and Assessment*** section of this document detailing the severity, likely hood and priority of each hazard and what controls you will implement to minimise the Risk of each one.		▪ go to 1.19

	Mechanical Hazards The following questions are meant purely as a guide. As this is a generic guide the questions cannot cover every hazard that you may encounter during your project.		
1.19	Does your project involve Rotating Machinery?	☐ Yes, go to 1.20	☐ No, go to 1.21
1.20	Document in the ***Additional Hazard Identification and Assessment*** section of this document the severity, likely hood and priority of this hazard and what controls you will implement to minimise the Risk.		▪ go to 1.21
1.21	Does your project involve Moving Machinery?	☐ Yes, go to 1.22	☐ No, go to 1.23
1.22	Document in the ***Additional Hazard Identification and Assessment*** section of this document the severity, likely hood and priority of this hazard and what controls you will implement to minimise the Risk.		▪ go to 1.23
1.23	Does your project involve any Manual Handling?	☐ Yes, go to 1.24	☐ No, go to 1.25
1.24	Document in the ***Additional Hazard Identification and Assessment*** section of this document the severity, likely hood and priority of this hazard and what controls you will implement to minimise the Risk.		▪ go to 1.25
1.25	Are there any other mechanical hazards associated with your project?	☐ Yes, go to 1.26	☐ No, go to 1.27
1.26	Document each hazard you can identify in the ***Additional Hazard Identification and Assessment*** section of this document detailing the severity, likely hood and priority of each hazard and what controls you will implement to minimise the Risk of each one.		▪ go to 1.27

	Chemical Hazards The following questions are meant purely as a guide. As this is a generic guide the questions cannot cover every hazard that you may encounter during your project.		
1.27	Are there any chemical hazards associated with your project?	☐ Yes, go to 1.28	☐ No, go to 1.29
1.28	Document each hazard you can identify in the ***Additional Hazard Identification and Assessment*** section of this document detailing the severity, likely hood and priority of each hazard and what controls you will implement to minimise the Risk of each one.		▪ go to 1.29

	Other Hazards		
1.29	Are there any other hazards that you have identified associated with your project?	☐ Yes, go to 1.30	▪ No, go to 1.31
1.30	Document each hazard you can identify in the ***Additional Hazard Identification and Assessment*** section of this document detailing the severity, likely hood and priority of each hazard and what controls you will implement to minimise the Risk of each one.		▪ go to 1.31

	Documentation		
1.31	This document must be kept for a period of five years after the project completion. This is a living document and you are responsible for upgrading this assessment if any previously unseen risk becomes evident during the course of the project. You maybe required to present this document to the WorkCover Authority on demand.	▪ Finished	▪ Finished

Section 2: Additional Hazard Identification and Assessment

How to Assess Risk

Step 1 – Consider the Consequences

What are the consequences of an incident occurring? Consider what could reasonably have happened as well as what actually happened.

Look at the descriptions and choose the most suitable Consequence.

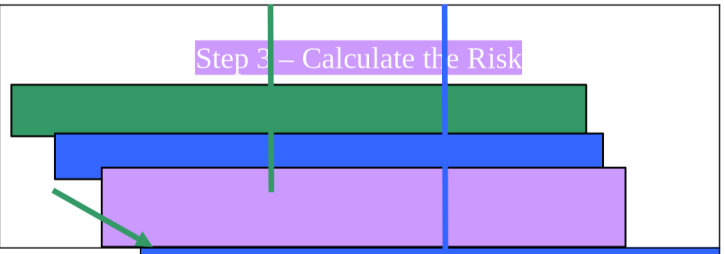
CONSEQUENCE

Step 2 – Consider the Likelihood

What is the likelihood of the consequence identified in step 1 happening? Consider this with the current controls in place.

Look at the descriptions and choose the most suitable Likelihood.

LIKELIHOOD



Consequence	Personal Damage – Injury or illness
Serious	Extensive injury / permanently maimed or death
Major	Long term injury or illness
Medium	Medical Attention required with time off work (Lost Time Injury)
Minor	First Aid required / Hazard or Near Miss event would reported with follow up action
Insignificant	No injury or hazard or near miss requiring follow up

Likelihood	Description
Almost Certain	The event can be expected to occur in most circumstances (> 85 % chance of occurrence)
Likely	The event has a reasonable chance (> 50 %) of occurring (regularly) in usual conditions
Possible	The event might occur occasionally, has occurred sometime in past 10 years (20-49 % chance)
Unlikely	The event has a small chance of occurring (6-19%), but has occurred sometime in past 25 years
Rare	Exceptionally unlikely to occur < 5 % chance

CONSEQUENCE	LIKELIHOOD				
	Rare	Unlikely	Possibly	Likely	Almost Certain
Serious	MED	MED	HIGH	EXTREME	EXTREME
Major	MED	MED	MEDIUM	HIGH	EXTREME
Medium	LOW	LOW	MEDIUM	MEDIUM	HIGH
Minor	LOW	LOW	LOW	MEDIUM	MEDIUM
Insignificant	Not applicable for health and safety risk assessment context				

- ”The magnitude of consequences of any event, should it occur, and the likelihood of the event and its associated consequences, are assessed in the context of the effectiveness of existing strategies and controls.” Section 3.4.3 AS/NZS 4360:2004, Risk Management.

Controlling the Risk

Risk control is a method of managing the risk with the primary emphasis on controlling the hazards at source. For a risk that is assessed as "high", steps should be taken immediately to minimize risk of injury. The method of ensuring that risks are controlled effectively is by using the "hierarchy of controls". The Hierarchy of Controls are:

Order No.	Control Type	Example
Firstly	Eliminate	Removing the hazard, eg taking a hazardous piece of equipment out of service.
Secondly	Substitute	Replacing a hazardous substance or process with a less hazardous one, eg substituting a hazardous substance with a non-hazardous substance.
Thirdly	Isolation	Isolating the hazard from the person at risk, eg using a guard or barrier.
Fourthly	Engineering	Redesign a process or piece of equipment to make it less hazardous.
Fifthly	Administrative	Adopting safe work practices or providing appropriate training, instruction or information.
Sixthly	Personal Protective Equipment	The use of personal protective equipment could include using gloves, glasses, earmuffs, aprons, safety footwear, dust masks. **NOTE: This is a last resort control and should be for interim periods only, while higher level control is developed or implemented.**

What is a hazard?

A Could people be injured or made sick by things such as: • Noise • Light • Radiation • Toxicity • Infection • High or low temperatures • Electricity • Moving or falling things (or people) • Flammable or explosive materials • Things under tension or pressure (compressed gas or liquid; springs) • Any other energy sources or stresses • Biohazardous material • Laser	**B What could go wrong?** • What if equipment is misused? • What might people do that they shouldn't • How could someone be killed? • How could people be injured? • What may make people ill? • Are there any special emergency procedures required?
C Can workplace practices cause injury or sickness? • Are there heavy or awkward lifting jobs? • Can people work in a comfortable posture? • If the work is repetitive, can people take breaks? • Are people properly trained? • Do people follow correct work practices? • Are there adequate facilities for the work being performed? • Are universal safety precautions for biohazards followed? • Is there poor housekeeping? Look out for clutter • Torn or slippery flooring • Sharp objects sticking out • Obstacles	**D How might these injuries happen to people?** • Broken bones • Eye damage • Hearing problems • Strains or sprains • Cuts or abrasions • Bruises • Burns • Lung problems including inhalation injury/ infection • Skin contact • Poisoning • Needle-stick injury
E Imagine that a child was to enter your work area • What would you warn them to be extra careful of? • What would you do to reduce the harm to them?	**F What are the special hazards?** • What occurs only occasionally-for example during maintenance and other irregular work?

For more information visit - http://www.newcastle.edu.au/current-staff/working-here/work-health-and-safety/managing-health-and-safety-risks

Risk Assessment Matrix

Likelihood

N.B. For more details regarding use of this matrix / definitions refer to final page of this document	Rare	Unlikely	Possible	Likely	Almost Certain
Severe *E.g. Extensive injury / permanently maimed or death*	**MEDIUM**	**MEDIUM**	**HIGH**	**EXTREME**	**EXTREME**
Major *E.g. Long term Injury or Illness*	**MEDIUM**	**MEDIUM**	**MEDIUM**	**HIGH**	**EXTREME**
Medium *E.g. Medical Attention required with time off work (Lost Time Injury)*	**LOW**	**LOW**	**MEDIUM**	**MEDIUM**	**HIGH**
Minor *E.g. First Aid required / Hazard or near miss reported with follow up action*	**LOW**	**LOW**	**LOW**	**MEDIUM**	**MEDIUM**
Insignificant *E.g. No injury or hazard or near miss requiring follow up*	Insignificant events not requiring follow up are not considered relevant within the context of a health and safety risk assessment framework: any health or safety risk is considered to have some significance.				

Consequence

Summary of Requirements

Personal Protective Equipment (PPE)	
Training	
Equipment **(Standard Operating Procedures)**	
Relevant Legislation etc.	WHS Act 2011 (NSW) & Regulations e.g. A.S. / Codes of Practice
Review period/date	

Actions required based on Risk Assessment

Extreme	An "extreme" risk requires immediate assessment and senior staff consideration is required; a detailed mitigation plan must be developed, and the activity should cease / not continue unless the risk can be reduced to a level of high or less; regular monitoring and reported on to the relevant management/steering committee; Target resolution should be within 3 - 6 months.
High	A "high" risk may also require immediate assessment and senior staff consideration; a mitigation plan must be developed; regular monitoring and reported on to the relevant management/steering committee. Target resolution (ideally reduction to medium or low level of risk) should be within 6 to 12 months.
Medium	A mitigation plan must be developed; existing controls, consequences and likelihood do not substantially change. Target resolution (ideally reduction to low level of risk) should be within 1 to 5 years.
Low	Risk is tolerable; manage by well established, routine processes/procedures and be mindful of changes to nature of risks.

Hazard Identification		Control		Risk Assessment
What are the steps of the activity / items of equipment?	**What are the potential hazards?**	**What methods will be used to reduce the likelihood and/or the consequence of an illness or injury from those hazards?**	**What hazard remains?**	**What is the level of risk remaining based on the Risk Assessment matrix?**
Charging LiPo batteries	**Fire/Explosion**	**Batteries will be inspected for damage to casing and wiring. Batteries should also be inspected for signs of swelling.** **All suspicious batteries should be placed in fire retardant bags for further assessment.** **Batteries should only be charged using an approved LiPo battery charging device.** **Batteries should be placed in the safety battery charging box when charging.**		**Medium**
Travelling with LiPo batteries	**Fire/Explosion**	**All batteries should be placed in individual fire retardant bags, or individual compartments in a fire retardant bag.**		**Medium**
Handling robots	**Pinching/crushing of fingers**	**Robots will always be handled via the robots backstrap or handle when the robot is powered on or in motion.**		**Low**

Walking	**Tripping**	**Uneven joins/edges of the field to be taped down. Presence of cables or other obstacles in walkways or on the field are to be kept to a minimum.**		**Low**
Overhead cables	**Choking/Neck/Head injury**	**Overhead cables to be reliably secured to ceilings and/or walls.**		**Low**
Suspended netting	**Head injury**	**Netting to be tied off at wall using wall fixture at all times.**		**Low**
Repairing robots	**Pinching/Crushing of fingers, Punctures**	**All tools (screwdrivers, vice grips, pliers, etc) to be used in a manner in which they are intended. Servo horns to be removed using servo horn tool.**		**Low**
Repairing robots	**Allergic reaction, Eye/skin irritation**	**Eye protection and gloves should be worn at all times while using Loctite.**		**Low**
Soldering	**Potential burns, fumes**	**Ensure users have read Safe Soldering Techniques located in the SEEC WHS website, ensure fume extraction is utilised and ensure users of soldering iron use safety glasses (particularly for SM devices)**		**Low**
Using ladder for motion capture set up	**Falling**	**Follow guidelines from https://www.safework.nsw.gov.au/hazards-a-z/ladders**		**Low**

This document must now be signed by the Assessor, the Project Supervisor and all participants of this project. Copies of all the documentation submitted with this Risk Assessment must be given to all participants in this project. The original documentation must be submitted to the Lab Manager.

Assessors Name:	Ysobel Sims		
Signature:			
Phone:		Date:	
APPROVED BY:			
Project Supervisor	Stephan Chalup		
Signature:			
Phone:		Date:	

Project Participants details[3]:

Name:				Name:				
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Name:				Name:				
Signature:				Signature:				
Phone:		Date:		Phone:		Date:		

[3] All project participants must sign this document and be issued with a copy of this document and any other documentation submitted with the original documentation set for this project.

Project Participants details[3]:								
Name:					Name:			
Signature:					Signature:			
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Project Participants details[3]:

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