

HAZARD IDENTIFICATION, RISK ASSESSMENT & WORK METHOD



Workplace : Ian Ross R103	Division/Portfolio: Research School of Engineering
Risk Assessor (s): E.Scipione	Assessment Date: 4 July 2017
Task or process being assessed : ENGN4625/6625 Semester 2 2017 Hardware Labs	
Course Convenor: Professor Rod Kennedy	

Section 1. Hazard Identification

Using tick boxes identify all hazards associated with the process being assessed, including equipment and substances.

1. Plant and Equipment (See also Appendix 1 for specific risk assessment)		4. Radiation (See also Appendix 1 for specific risk assessment)	
1.1 Vehicles, transport	<input type="checkbox"/>	4.1 Ionizing	<input type="checkbox"/>
1.2 Plant, machinery, equipment in motion	<input checked="" type="checkbox"/>	4.2 Ultraviolet	<input type="checkbox"/>
1.3 Compression/tension/stored energy	<input type="checkbox"/>	4.3 Infrared	<input type="checkbox"/>
1.4 Noise	<input type="checkbox"/>	4.4 Laser	<input type="checkbox"/>
1.5 Vibration	<input type="checkbox"/>	4.5 Radiofrequency	<input type="checkbox"/>
1.6 Firearms	<input type="checkbox"/>	4.6 Electromagnetic Field	<input type="checkbox"/>
1.7 Pressure equipment (high/vacuum)	<input type="checkbox"/>	4.7 Extremely Low Frequency	<input type="checkbox"/>
1.8 Tools, sharps, cutting implements	<input checked="" type="checkbox"/>		
		5. Hazardous Environment	
2. Biological (See also Appendix 2 for biological supplement)		5.1 Confined spaces	<input type="checkbox"/>
2.1 Biological materials	<input type="checkbox"/>	5.2 Working at heights	<input type="checkbox"/>
2.2 Biological materials involving GMOs	<input type="checkbox"/>	5.3 Working at sea or in water bodies	<input type="checkbox"/>
2.3 Allergens / sensitisation	<input type="checkbox"/>	5.4 Heat/ cold stress	<input type="checkbox"/>
2.4 Irritants	<input type="checkbox"/>		
2.5 Geno toxins (mutagens, teratogens)	<input type="checkbox"/>	6. Gases	
2.6 Zoonoses	<input type="checkbox"/>	6.1 Flammable	<input type="checkbox"/>
2.7 Handling of small animals	<input type="checkbox"/>	6.2 Asphyxiant inert gas	<input type="checkbox"/>
2.8 Handling of large animals	<input type="checkbox"/>	6.3 Toxic gas	<input type="checkbox"/>
2.9 Handling of human samples	<input type="checkbox"/>	6.4 Gas cylinders / tanks	<input type="checkbox"/>
		6.5 Pressurised lines	<input type="checkbox"/>
3. Chemical/Hazardous Substances (See also Appendix 1 for specific risk assessment)			
3.1 Carcinogens	<input type="checkbox"/>	7. Electricity (See also Appendix 1 for specific risk assessment)	
3.2 Sensitising agents	<input type="checkbox"/>	7.1 High voltage equipment	<input type="checkbox"/>
3.3 Corrosive/oxidising agents	<input type="checkbox"/>	7.2 Live electrical equipment	<input type="checkbox"/>
3.4 Irritants	<input checked="" type="checkbox"/>	7.3 Static charge	<input type="checkbox"/>
3.5 Geno toxins (mutagens, teratogens)	<input type="checkbox"/>		
3.6 Toxic/harmful substances	<input type="checkbox"/>	8. Temperature	
3.7 Solvents	<input type="checkbox"/>	8.1 High temperature materials	<input checked="" type="checkbox"/>
3.8 Generation of dusts, vapours, fumes etc.	<input checked="" type="checkbox"/>	8.2 Cryogenic fluids	<input type="checkbox"/>
3.9 Asbestos	<input type="checkbox"/>		
		9. Fire and Explosion	
		9.1 Flammable substances	<input type="checkbox"/>

		9.2 Explosives	<input checked="" type="checkbox"/>
10. Personal			
10.1 Manual handling incl striking & grasping	<input checked="" type="checkbox"/>	10.6 Working alone	<input type="checkbox"/>
10.2 Slips, trips and falls	<input type="checkbox"/>	10.7 Field work	<input type="checkbox"/>
10.3 Fixed Posture, e.g. microscopy	<input type="checkbox"/>	10.8 Mental stress	<input type="checkbox"/>
10.4 Repetitive and/or overuse movements, e.g. keyboarding, pipetting	<input type="checkbox"/>	10.9 Overseas travel / work (vaccinations)	<input type="checkbox"/>
10.5 Pressure (diving/altitude)	<input type="checkbox"/>	10.10 Engulfment e.g. in sand	<input type="checkbox"/>
11. Other - Specify: Work on live low voltage circuitry. Performing indirect measurements on mains voltages.			

Section 2. [Summary of Identified Hazards](#)

1.	<p>Hazard 1.2: Equipment in motion</p> <p>Some lab experiments may use rotating equipment such as motors, motor/load sets and household items like electric drills.</p>		
2.	<p>Hazard 1.8: Use of pliers, cutters, wire strippers and test probes</p> <p>Pliers, cutters and wire strippers are used to cut and strip wire and dress electronic components during the construction of circuits for experiments.</p> <p>Cut and pinch injuries can result from careless/incorrect use of pliers, cutters and wire strippers.</p> <p>Injuries can occur from wire flying about, if not restrained during cutting of wire or component legs.</p> <p>Multimeter and oscilloscope probes may have sharp points which can result in stab injuries.</p>	10.	
3.	<p>Hazard 3.4: Solder fumes can cause irritation Hazard 3.8: Generation of soldering fumes</p> <p>The lab experiments are performed on breadboards which require no soldering.</p> <p>Although occasionally there may be a requirement to perform a very small amount of soldering. For example to solder a wire onto a component to extend its leads to make it possible to plug into the breadboard. The process of soldering can generate fumes.</p> <p>Only flux cored solder is used. No extra flux or board cleaners are used.</p> <p>The lead in solder and soldering fumes can be harmful or cause irritation if ingested or inhaled.</p>	11.	
4.	<p>Hazard 8.1: Solder Splashes</p> <p>Molten solder can splash, splatter and "spit". In particular wires or components that are being desoldered can act as a spring to toss a solder blob into the air.</p>	12.	
5.	<p>Hazard 8.1: Burns and fire</p> <p>Burns and fire can result from the contacting of hot objects associated with soldering, namely the soldering iron or surfaces heated by the iron.</p>	13.	

6.	Hazard 8.1: Equipment Overheating Experiments may involve use of equipment like motor/load sets and high power rheostats which can overheat if run continuously under constant high load.		
7.	Hazard 9.2: Electrolytic capacitors can leak or explode Electrolytic capacitors are used in some of the ENGN4625 hardware lab experiments. Electrolytic capacitors are polarised components which can leak or explode if incorrectly connected into circuit.	14.	
8.	Hazard 10.1: Manual Handling Some lab equipment used can be bulky and heavy.		
9.	Hazard 11: Work on live low voltage circuitry. Performing indirect measurements on mains voltages. The experiments involve construction, testing and performing measurements on low voltage circuitry. Some experiments involve performing measurements on the mains supply. These measurements are performed indirectly using voltage and current transformers.	15.	
7.		16.	
8.		17.	
9.		18.	
Any specific circumstances (describe):			
Persons at Risk: (list) Students, lab demonstrators			

Section 3. Risk Assessment

List identified hazards and detail measures taken to address the hazards. For Plant, Chemical, Radiation and Electrical Hazards use specific risk assessments found in Appendix 1. Expand form electronically or attach additional information where required. See [here](#) for further Risk Assessment information.

Controls to be considered from the following [hierarchy of control](#)

- | | |
|-----------------|--|
| 1. Elimination | 4. Engineering |
| 2. Substitution | 5. Administration |
| 3. Isolation | 6. Personal Protective Equipment (PPE) |

<u>Identified Hazards</u>	<u>Raw Risk Assessment</u>		<u>Risk Rating</u>	Required Controls	Controls Implemented	
	<u>Likelihood</u>	<u>Consequence</u>				
1	Unlikley	Minor	Low	<p>1) Students and lab demonstrators are to be made aware of hazard. This is to be done on the ENGN4625 Wattle website and during lab classes.</p> <p>2) Students will need to sign off that they have read and understood this Hazard Identification, Risk Assessment and Work Method document and will comply with it. This sign off is to be done prior to/or at the start of the first lab.</p> <p>3) Make sure loose hair, jewellery and clothing is tied back.</p> <p>4) Ensure if the equipment has any protective covers that these are in place.</p> <p>5) Students and lab demonstrators are required to wear safety glasses.</p>	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
2	Unlikley	Minor	Low	<p>1) Students and lab demonstrators are to be made aware of hazard. This is to be done on the ENGN4625 Wattle website and during lab classes.</p> <p>2) Students will need to sign off that they have read and understood this Hazard Identification, Risk Assessment and Work Method document and will comply with it. This sign off is to be done prior to/or at the start of the first lab.</p> <p>3) Students and lab demonstrators are required to wear safety glasses, if not wearing prescription glasses.</p> <p>Although, it is strongly recommended that safety glasses are worn even when prescription glasses are used. The safety glasses are designed to fit over prescription glasses and not only provide better protection of eyes but will also protect the prescription glasses.</p> <p>4) Component legs or wire being cut should be restrained to stop them flying about.</p> <p>5) Care should be taken to use the tools correctly and not create situations which can cause cut or pinch hazards to the</p>	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>

				<p>hands, fingers, face or other parts of the body.</p> <p>6) Multimeter and oscilloscope probes can have sharp points.</p> <p>Care should be taken when handling probes so as to avoid stab injuries.</p> <p>When making measurements care should be taken to avoid probes slipping and causing stab injuries.</p> <p>The probes have clips and covers that should be replaced on the probes when not in use. Care should be taken not to misplace these probe clips and covers.</p>		
3	Unlikley	Minor	Low	<p>1) Students and lab demonstrators are to be made aware of hazard. This is to be done on the ENGN4625 Wattle website and during lab classes.</p> <p>2) Students will need to sign off that they have read and understood this Hazard Identification, Risk Assessment and Work Method document and will comply with it.</p> <p>This sign off is to be done prior to/or at the start of the first lab.</p> <p>3) <u>Solder Fumes</u> Avoid inhalation of soldering smoke/fumes. Soldering fumes may cause irritation of mucous membranes, respiratory system and eyes.</p> <p>As soldering fume generally rises vertically, it is easy to enter the breathing zone of the operator. Avoid breathing fumes by keeping your head to the side of, not above, your work</p> <p>4) <u>Protective Clothing</u> Users should wear long sleeve shirts and pants (or a lab coat) that are made from natural fibres (eg cotton). Closed toe shoes must be worn during soldering activities.</p> <p><i>Note: it is a requirement to wear closed toe shoes at all times in Laboratories.</i></p> <p>5) <u>Eye Protection</u> Students and lab demonstrators are required to wear safety glasses, if not wearing prescription glasses.</p> <p>Although, it is strongly recommended that safety glasses are worn even when prescription glasses are used. The safety glasses are designed to fit over prescription glasses and not only provide better protection of eyes but will also protect the prescription glasses.</p> <p>6) <u>Washing of hands</u> Skin contact with lead is not a hazard, but</p>	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>

				<p>getting lead dust on your hands can result in it being ingested if hands are not washed before eating, smoking etc.</p> <p>To prevent the ingestion of lead, hands should be washed with soap and water before breaks, before eating, prior to smoking and at the completion of soldering activities.</p> <p><i>Note: <u>Lead free solder</u> will be used for any soldering activities. But the above practice of washing hands after soldering and before eating etc. is still recommended.</i></p> <p><i>Note: Food, drink and their consumption is not permitted in Laboratories.</i></p>		
4	Unlikley	Minor	Low	<p>1) Students and lab demonstrators are to be made aware of hazard. This is to be done on the ENGN4625 Wattle website and during lab classes.</p> <p>2) Students will need to sign off that they have read and understood this Hazard Identification, Risk Assessment and Work Method document and will comply with it.</p> <p>This sign off is to be done prior to/or at the start of the first lab.</p> <p>3) Students and lab demonstrators are required to wear safety glasses, if not wearing prescription glasses.</p> <p>Although, it is strongly recommended that safety glasses are worn even when prescription glasses are used. The safety glasses are designed to fit over prescription glasses and not only provide better protection of eyes but will also protect the prescription glasses.</p> <p>4) To prevent burns from splashing hot solder, long sleeve shirts and pants (or a lab coat) that are made from natural fibres (eg cotton) should be worn. Closed toe shoes must be worn during soldering activities.</p> <p><i>Note: it is a requirement to wear closed toe shoes at all times in Laboratories.</i></p>	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
5	Unlikley	Minor	Low	<p>1) Students and lab demonstrators are to be made aware of hazard. This is to be done on the ENGN4625 Wattle website and during lab classes.</p> <p>2) Students will need to sign off that they have read and understood this Hazard Identification, Risk Assessment and Work Method document and will comply with it.</p> <p>This sign off is to be done prior to/or at the start of the first lab.</p> <p>3) While using the soldering equipment the following should be noted:</p>	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>

				<ul style="list-style-type: none"> • Never leave turned on soldering irons unattended. • Do not set the hot soldering iron down on anything other than its stand. This is to prevent it from burning things in the work area. • Do not to allow the hot soldering iron to contact surrounding equipment, cables or objects. • Do not to allow the hot soldering iron to contact hands, fingers or other parts of the body. • To prevent burning fingers, use needle nose pliers, etc to hold items whilst soldering. 		
6	Unlikley	Minor	Low	<p>1) Students and lab demonstrators are to be made aware of hazard. This is to be done on the ENGN4625 Wattle website and during lab classes.</p> <p>2) Students will need to sign off that they have read and understood this Hazard Identification, Risk Assessment and Work Method document and will comply with it. This sign off is to be done prior to/or at the start of the first lab.</p> <p>3) Equipment must only be run continuously for 5-10 minutes at a time and given time to cool down.</p>	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
7	Unlikley	Minor	Low	<p>1) Students and lab demonstrators are to be made aware of hazard. This is to be done on the ENGN4625 Wattle website and during lab classes.</p> <p>2) Students will need to sign off that they have read and understood this Hazard Identification, Risk Assessment and Work Method document and will comply with it. This sign off is to be done prior to/or at the start of the first lab.</p> <p>3) Students and lab demonstrators are required to wear safety glasses, if not wearing prescription glasses.</p> <p>Although, it is strongly recommended that safety glasses are worn even when prescription glasses are used. The safety glasses are designed to fit over prescription glasses and not only provide better protection of eyes but will also protect the prescription glasses.</p> <p>4) The capacitor values/ratings used along with the low circuit voltages used mean that capacitors will not fail catastrophically.</p>	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>

				<p>5) Circuits using electrolytic capacitors are to be checked by lab demonstrators first before being powered up.</p> <p>6) To give further protection, students must use the provided inline fuse leads in their experimental circuits.</p>		
8	Unlikley	Minor	Low	<p>1) Students and lab demonstrators are to be made aware of hazard. This is to be done on the ENGN4625 Wattle website and during lab classes.</p> <p>2) Students will need to sign off that they have read and understood this Hazard Identification, Risk Assessment and Work Method document and will comply with it. This sign off is to be done prior to/or at the start of the first lab.</p> <p>3) Equipment will normally be setup and not require moving. If for some reason equipment is to be moved care should be taken to avoid manual handling issues.</p>	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
9	Unlikley	Minor	Low	<p>1) Students and lab demonstrators are to be made aware of hazard. This is to be done on the ENGN4625 Wattle website and during lab classes.</p> <p>2) Students will need to sign off that they have read and understood this Hazard Identification, Risk Assessment and Work Method document and will comply with it. This sign off is to be done prior to/or at the start of the first lab.</p> <p>3) Students and lab demonstrators are required to wear safety glasses, if not wearing prescription glasses.</p> <p>Although, it is strongly recommended that safety glasses are worn even when prescription glasses are used. The safety glasses are designed to fit over prescription glasses and not only provide better protection of eyes but will also protect the prescription glasses.</p> <p>4) When using the DMMs (Digital Multimeters) and oscilloscopes the following practices should be followed:</p> <ul style="list-style-type: none"> • Before using the DMMs or oscilloscope inspect the test leads and probes for damaged insulation or exposed connections • Ensure that fingers, hand or other parts of the body do not make accidental contact with the circuit being measured. • When using the test leads keep your fingers behind the finger guards. 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>

				<ul style="list-style-type: none"> • Ensure that the measurement switches are placed in the correct position prior to conducting the measurement. To prevent damage to the test equipment, do not change the measurement switch while conducting a measurement. • Take care not to select the incorrect measurement range or place test leads into incorrect input terminals eg current or resistance setting when measuring voltage. Damage can occur to not only the test equipment but also the circuit under test. <p>5) Students must use the provided inline fuse leads in their experimental circuits.</p> <p>6) Students must not work on circuits that require or generate voltages that are greater than ELV (Extra Low Voltage) levels, namely 60Vdc or 30Vrms (42.4Vpk).</p> <p>7) Any experiments that involve mains supply measurements must be done indirectly with the voltage and current transformers provided.</p> <p>No direct connection to the mains is permitted.</p> <p>Experimental setups must be checked by demonstrators before powering up.</p> <p>These labs must be performed in the physical presence of demonstrators</p> <p>8) Students are not permitted to replace fuses in lab equipment.</p> <p>Should any lab equipment require fuse replacement, this is to be referred to either the Lab Demonstrators or the Technical Staff for replacement.</p>		
	Select	Select	Select		Yes <input type="checkbox"/>	No <input type="checkbox"/>
	Select	Select	Select		Yes <input type="checkbox"/>	No <input type="checkbox"/>

Section 3 continued – Residual Risk Assessment

<u>Identified Hazards</u>	<u>Likelihood</u>	<u>Consequence</u>	<u>Residual risk rating</u>
1	Unlikley	Minor	Low
2	Unlikley	Minor	Low
3	Unlikley	Minor	Low
4	Unlikley	Minor	Low
5	Unlikley	Minor	Low
6	Unlikley	Minor	Low
7	Unlikley	Minor	Low
8	Unlikley	Minor	Low
9	Unlikley	Minor	Low

Section 4 – Implementation Plan			
<u>Control Option</u>	Resources	Person(s) Responsible	Proposed Implementation date
<ul style="list-style-type: none"> Students are to be made aware of risks: <ul style="list-style-type: none"> a) Information provided on ENGN4625 Wattle website. b) Students reminded during lab sessions. 	Course Convener Lab Demonstrators	Course Convener Course Convener	Before start of ENGN4625 labs Ongoing during labs
<ul style="list-style-type: none"> Students to sign off that they have read, understood and will comply with the Hazard Identification, Risk Assessment and Work Method document. 	Lab Demonstrators	Course Convener	Prior to/or at the start of first lab
<ul style="list-style-type: none"> Wearing of safety glasses. Ensure students wear safety glasses. Remind students during lab sessions. 	Lab Demonstrators	Course Convener	Ongoing during labs
<ul style="list-style-type: none"> Circuits using electrolytic capacitors are checked by lab demonstrators before being powered up. 	Lab Demonstrators	Course Convener	Ongoing during labs
<ul style="list-style-type: none"> Ensure students use the provided inline fuse leads in their experimental circuits 	Lab Demonstrators	Course Convener	Ongoing during labs
<ul style="list-style-type: none"> Any experiments that involve mains supply measurements must be done indirectly with the voltage and current transformers provided. No direct connection to the mains is permitted. Experimental setups must be checked by demonstrators before powering up. These labs must be performed in the physical presence of demonstrators. 	Lab Demonstrators	Course Convener	Ongoing during labs

Section 5 – Consultation

Have relevant staffs been consulted in relation to this risk assessment? Yes ☒ No ☐ If yes, indicates who was consulted.

Name: Prof. Rod Kennedy (ENGN4625/6625 Course Convener)

Date: 4 July 2017

Name:

Date:

Section 6 – Comments and Endorsements

Name:

Signature:

Date:

Assessment Approval:

I am satisfied that the risks are not significant and/or adequately controlled and that resources required will be provided.

Name: Professor Rod Kennedy

Position Title: ENGN4625/6625 Course Convener

Supervisor

Signature: Prof. Rod Kennedy

Date: 4 July 2017

Document Version Control

Version Number	Created/Modified By	Date	Status	Additional Information
1.0	E. Scipione	4 July 2017	Final	Initial release of document