

**Departmental
Safety Code of Practice**

**Department of
Electronic and Computer
Engineering**

Rev. 2

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1. 0 Introduction

This Code of Practice is designed to address the particular arrangements for safe working in the Department of Electronic & Computer Engineering.

It should be read in conjunction with the University Safety Statement. The University Safety Statement sets out duties and responsibilities of staff and students as well as general policies and arrangements for safety within the University. It is the duty of all of us to take reasonable care of one's own health and safety and that of any other person who may be affected by our acts and to maintain a safe and healthy working environment.

The Safety Statement is available through Departmental and Divisional offices and via the Human Resources web site.

Staff should also familiarise themselves with the Emergency Plan for the Main Building and other buildings in which they may be located.

An essential element of safety in the workplace is knowledge of correct procedures and of dangers associated with each particular procedure or operation. These procedures provide a framework within which safe working is possible. It is important that the procedures in this document are followed for the prevention of accidents. Comments and suggestions to improve the safety procedures in this Departmental Safety Code of Practice will be welcomed, and incorporated into future editions.

Statutory Requirement: Section 13 of the Safety, Health and Welfare at Work Act 2005 places a number of obligations on employees while at work.

It is the duty of all employees while at work to –

- Comply with health and safety legislation.
- Take reasonable care for your own safety and that of any other person who may be affected by your acts or omissions while at work.
- Not be under the influence of alcohol or drugs or a combination of alcohol or drugs to the extent that it is likely to endanger your own safety or that of any other person.
- Co – operate with your employer and any other authorised person so that they may comply with their obligations under the act.
- Not engage in improper conduct or other behaviours such as violence, bullying or horseplay, which could endanger another person at work.
- Use all appliances, protective clothing or safety devices provided in the correct manner so as to provide the protection intended.
- Report without delay, any defects in plant, equipment, place of work or systems of work, of which you become aware.

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- Correctly use any article or substance and protective clothing and equipment provided for use at work or for your own protection.
- Not to intentionally or recklessly interfere or misuse any appliance, equipment, protective clothing or anything, which has been provided to secure the safety, health and welfare of persons at work.

1.1 Departmental Contacts

Position	Name	Phone no
Head of Department with overall responsibility for safety	Dr Martin Hayes	2577
Departmental Safety Advisor Chief Technical Officer	Mr. John Bird	2459
Day to day responsibility for safety – Chief Technical Officer	Mr John Bird	2459
First Aid	Jimmy O’Sullivan Sean McGrath	2102 2608
Accidents must be reported to Chief Technical Officer	John Bird or room/class supervisor	2459
Evacuation Stewards	Jimmy O’Sullivan Emily Spencer	2102 2954
Laser Safety Officer	Michael Connelly	2173
University Safety Officer	Philip Thornton	2239 086 8351374

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1.2 Fire Assembly points

Fire assembly points 1, 9 & 3

1.3 Location of first aid box

First aid boxes are located in each laboratory, refer to Appendix 1. Jimmy O'Sullivan maintains the contents

2.0 Arrangements for safe working

2.1 Training

The training needs of the staff are determined by the Head of the Department in conjunction with the Departmental Safety Advisor and the Safety Officer. Any other staff or students with concerns regarding appropriate safety training should raise the issue with the Head of the Department or their supervisor.

Relevant staff will receive the following training;

- Safety induction for undergraduates; post graduates and research workers
- Manual handling
- First aid
- Laser safety
- Chemical safety
- Fire safety
- Display screen equipment
- Risk assessment

Records of course content, trainer and trainee details are kept by the Departmental Safety Advisor or the Safety Officer.

Refresher training will be provided as required.

2.2 First aid and the reporting of accidents and near misses

Jimmy O'Sullivan is the trained first aider. A first aid box is located in each laboratory, refer to Appendix 1.

All accidents and near misses (incidents that could have lead to a serious injury but didn't) must be reported to John Bird.

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The immediate supervisor and/or the Departmental Safety Advisor, or the Head of Department will investigate the causes of the incident and complete the University Accident Report Form or the University Dangerous Occurrence Form. Copies of the completed form should be forwarded to the Safety Officer and the Department, Buildings & Estates.

The purpose of an investigation is to establish all the facts relating to the incident, to draw conclusions from the facts and make recommendations to prevent reoccurrence. Each accident will be looked at from the point of view of place, plant, procedures and people, to see where the safety system has failed and to tighten controls

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2.3 Consultation and communication

If Departmental staff feel or are made aware of any unsafe practices or unsafe equipment they are encouraged to bring this to the attention of their supervisor or the Head of Department as soon as possible.

The staff in each University building has nominated/elected a person to act as a Safety Representative. Safety Representatives meet on a regular basis to review safety performance and to make recommendations to the University management. The purpose of this consultation is to promote and develop measures to ensure the safety, health and welfare of all employees and in determining the effectiveness of such measures.

This document will be reviewed on an annual basis (or more frequently if work practices change or new equipment is introduced). Staff and the Safety Representatives will be consulted on any changes to be made.

2.4 Safety Responsibilities

The following safety responsibilities are highlighted from the University safety statement and contain additional responsibilities that are specific to the Department.

2.4.1 Head of the Department

The Head of the Department has overall responsibility for safety in the Department. The Head of the Department will ensure that this code of practice and the University Safety Statement are implemented and that all staff and students of the Department are aware of its contents and their responsibilities as set out in both documents.

2.4.2 Academic staff

Academic staff must:

- Take safety into account in the design of experiments for undergraduates

- Ensure that postgraduate students take account of safety issues when designing their experiments.

- Ensure that all students under their supervision are aware of their responsibilities under the University Safety Statement and this Departmental Safety Code of Practice. Undergraduate student must initially be assumed to be untrained in all aspects of safety

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Ensure that equipment under their control is maintained in a safe manner and according to the manufacturer's instruction where applicable. All maintenance and servicing must be recorded for each piece of equipment. Only competent authorised students must be allowed to use equipment.

Ensure that all accident or incidents that occur in their area of responsibility are notified to the Departmental Safety Advisor and/or Head of Department, and to cooperate in follow-up action.

Cooperate with the Head of the Department in all aspects of safety

2.4.3 Departmental safety advisor

The Departmental safety advisor acts as a focal point for safety information/issues in the Department. The duties of the post include:

Being familiar with the Departmental Safety Code of Practice and the University Safety Statement.

Collate and disseminate any relevant safety information from the college safety officer to the appropriate people in the Department.

Maintain all Departmental safety records such as training, accidents/incidents.

Assist in the development of risk assessments (with the relevant Department individuals and the Safety Officer) where new activities are introduced or existing one modified.

2.4.4 Technical staff

Technical staff must:

Ensure that all safety equipment in their areas of responsibility are maintained in functioning order.

Maintain all equipment under their control in a safe operating condition. All maintenance and servicing must be carried out by a competent person. A record of all maintenance and servicing must be kept.

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2.4.5 Students

Students must make themselves aware of the safety instructions relating to any equipment they use.

Follow all safety instructions from supervisory staff.

Wear all Personal Protective Equipment as instructed.

Report all equipment problems or other unsafe systems they are aware of.

Take care of their own safety and the safety of others who may be affected by their behaviour.

2.5 Personal protective equipment

Individual risk assessments in section 3 of this document set out when personal protective equipment must be worn. Staff and students are legally obliged to wear PPE. The Department is responsible for purchasing personal protective equipment and ensuring it is to the correct standard.

Staff are responsible for ensuring that replacement equipment is obtained from the Chief Technical Officer when required.

2.6 Machinery /Equipment

2.6.1 General laboratory equipment

Over a period of time equipment will deteriorate through use or mis-use and faults if not detected and corrected could prove fatal. For this reason a system of preventative maintenance is vital. The manufacturer's instructions and operating experience should always be taken into consideration when deciding on what preventative maintenance checks are necessary. These checks should normally take place bi-annually or more frequently as required. All checks carried out, faults found, corrections made and results of any tests should be recorded in the *Department Preventative Maintenance Record Sheets*. These records together with any other maintenance records for a particular piece of equipment must be correctly filed for easy access and reference.

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2.6.2 Portable equipment

Modern portable electrical equipment is generally manufactured to high safety standards yet it probably accounts for more fatal accidents than any other single cause. Accidents usually occur because the equipment is used in conditions for which it was not intended or, most likely, because it has not been maintained over years of use.

The practice from now is that each item of portable equipment should be identified with a number and that number and a brief description of the equipment recorded in a register. The equipment should be checked by the relevant technical officer at least once a year. This arrangement ensures that all portable electrical equipment will be inspected and provides a means of identifying any item that is not on the register. Those using the equipment should report any suspected faults and remove it from service pending investigation and / or repair.

Staff and postgraduates should report any defects in equipment to the relevant technical officer.

Machinery guards must be replaced after repairs have been completed.

Staff should not attempt to repair equipment unless they are competent to do so.

Major repairs and servicing shall be carried out by specialist contractors.

Inspection and maintenance programmes shall be drawn up for all hazardous equipment. Statutory inspections on pressure vessels, compressors etc are to be arranged.

Records of all servicing and repairs are maintained.

2.7 Risk Assessment

The Head of Department or a designated person from amongst the Departmental staff should undertake risk assessments in all areas under Departmental control. The assessment process should be recorded on the University's Risk Assessment Sheet.

The Head of Department must carry out an annual safety inspection to monitor the effectiveness of his/her Safety Programme.

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2.8 Arrangements for working in laboratories outside normal operating hours.

The ECE laboratory facilities may be used by postgraduate students and staff outside of normal operating hours on the express condition they have a valid security permit and fulfil all of the conditions attached to the use of this permit.

Outside of normal operating hours is defined as weekends and after 18h00 Monday to Friday.

These procedures are enforced by Federal Security on behalf of the ECE. Federal Security shall be authorised by the ECE Department to ask people to leave the laboratory if they fail to fulfil any of the requirements laid down by this procedure. Federal Security will report any breaches to the Head of Department or Chief Technical Officer and offenders will be penalised.

In cases where this procedure prevents students from carrying out necessary work, consideration may be given to making exceptions, provided a safe alternative is agreed and approved by the Head of Department or Chief Technical Officer. Any such requests should be made, well in advance, in writing to the Head of Department or Chief Technical Officer outlining the circumstances and reasons for the request.

2.8.1 Security Permit

This permit is available from Chief Technical Officer. It permits the student to carry out standard laboratory procedures. The following information must be included before the permit is valid:

- Name of person
- Laboratory in which work is authorised
- Date of issue
- Time period you require cover for
- Name of a second person who will be in attendance during this period, more than one name can appear here
- Brief description of work being carried out
- Signature of Research Supervisor
- Signature of Senior Technician

2.8.2 Conditions Attached to Security Permit

- Students and staff must have their I.D. cards available to show Federal Security.

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- The student must sign in on the Security Logbook at Main Reception; from Monday to Friday this must be done at 18h00 and at weekends before one enters the laboratory. The following information must be provided: *name, date, time in, room number and named second person.*
- The student must sign out in the Security Logbook when leaving the building.
- The named second person should be in the laboratory or in an adjacent location. The named second person must also sign in and out on the Security Logbook if they are doing laboratory work.
- If specified, appropriate personal protective equipment must be worn at all times if working in a laboratory.

2.8.3 Working alone

Under normal circumstances working alone is not normally permitted. However, because of special circumstances it has been agreed that people working in the ECE laboratories can work alone provided the following requirements are met;

- Must be an authorised user and included on the list which is displayed on the door.
- Must have a valid permit.
- Must sign in and out on the Security Logbook as normal.
- Must telephone Federal Security, 061 202010, on arrival to inform them you are in the room.
- Must telephone Federal Security once an hour to check in.
- Must telephone Federal Security when leaving.

2.9 Unattended experiments

If an experiment in a laboratory will be left unattended or will be continuing overnight, an Unattended Experiment Form must be completed. Unattended experiments must be failsafe.

2.9.1 Purpose

Any experimenter utilising any of the services listed on the form (i.e. water, electricity etc.) will be notified if there is a problem. In addition, emergency personnel will have the necessary information to respond to an emergency.

2.9.2 Procedure

- Three copies of the form should be filled out. The first copy should be posted on the outside of the lab door
- The laboratory lights should be left on.
- The second copy should be given to the Chief Technical Officer.
- The third copy should be given to the experimenter's laboratory supervisor.

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- The form must be filled out completely. Include the phone number where you can be contacted. Always list two other individual's phone numbers that can be contacted in case of an emergency, including your lab supervisor.
- Always show an experiment "ending date" on the form. If the experiment extends beyond this date, fill out and send a new Overnight Experiment Notice.
- Any special instructions should be written clearly. Hazardous substances in use should be listed.
- Any reaction that represents an unusual or extreme hazard should NOT be left unattended.

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3.0 Hazards and Control Measures

3.1 Chemical Agents

Hazards

A range of hazardous chemicals are used and stored throughout the Department. Exposure to these substances may cause injury or illness.

Risk assessment: Medium - High

Control

3.1.1 General

- a) Chemical Agent Risk Assessments will be carried out for activities which involve the storage, use and disposal of any chemical or hazardous agent. Following the risk assessment, measures may be specified to ensure that the risk is reduced to the lowest possible level. Measures may include substitution of one chemical for a less hazardous one, restricting the number of persons using or in contact with the chemical, engineering controls such as the use of a fume hood, training or the use of personal protective equipment. (See appendix for HF acid risk assessment).
- b) Each laboratory must keep an up to date printed copies of all Safety Data Sheets (SDS's) for chemicals stored or used in that laboratory. When new chemicals are ordered the relevant SDS will be requested from the supplier. The SDS must be readily available to all lab users.
- c) Before new chemicals are ordered staff must ensure that safer alternatives have been investigated. A safer alternative could be purchasing a solution rather than making up a stock from a hazardous dust-forming powder.
- d) Staff must be familiar with the contents of the SDS and bring to the attention of students the hazards associated with the chemicals.
- e) Staff must be aware of the spillage clean up procedures for the chemicals they use on a regular basis. *Spillage clean up kits are supplied in each laboratory where chemicals are used, refer to Appendix 1.*
- f) Toxic chemicals should be kept in a locked cupboard. All operations with these compounds must be performed in a fume cupboard. Chemical traps should be used whenever possible to minimise the escape of vapours. Care must be taken to avoid skin contact, ingestion or inhalation of toxic materials or harmful materials.

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- g) Poisons are to be kept in a locked cabinet at all times. The hazards associated with the use of poisons must be assessed before they are purchased. Poisons will not be issued without the permission of the Senior Technician and the appropriate Academic Supervisor. Furthermore, it is essential that any poisons issued; are kept locked away; unused quantities returned to the store immediately; waste segregated, labelled and disposed of in a safe fashion.

3.1.2 Storage of chemicals

- a) Ensure that all containers are in good condition, properly capped, and properly labelled.
- b) There should be no unlabeled container, and no container should ever be labelled using the word WASTE or SPENT alone.
- c) Solutions or chemicals stored in containers other than their original container or waste must be labelled with the name of the chemical, the concentration if relevant, the hazard warning (e.g. toxic, corrosive, flammable etc), the name of the person responsible for making up the solution, the date the solution was made up.
- d) Store incompatible chemicals separately. Safety Data Sheets provide information on incompatibility.
- e) Do not store chemicals in alphabetical order without consideration for chemical compatibilities. An alphabetical system may cause incompatible materials being stored next to one another (e.g. butadiene next to bromine or chlorine).
- f) Do not store hazardous chemicals above eye level.

3.1.2.1 Flammables

- a) Flammable materials must be stored in a flammables cabinet. The door of the cabinet should be kept closed when not in use.
- b) Segregate flammables from oxidizing acids and oxidizers.
- c) Volumes of flammables stored should be kept to a minimum. No more than 50 litres of flammable liquids should be stored in any laboratory and then only when there are suitable flammables cabinets.
- d) Consideration should be given to letting the supplier deliver flammables 'just in time'.

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- e) Flammables in glass Winchesters should not be left on the bench in sunlight as they are likely to reach their flash point and cause an explosion and fire.
- f) Flammables must not be stored in fume hoods where there is a bunsen burner or other heat source.
- g) Secure screw caps on containers immediately following dispensing.
- h) Do not dispense into beakers and allow to remain at bench top level. Flammables should be placed in a fume hood as soon as possible and used
- i) Do not allow flammable liquids to evaporate in a fume hood as a means of disposal.
- j) Eliminate ignition sources such as open flames, hot surfaces, operation of electrical equipment, and static electricity from areas in which flammable or combustible materials are used or stored.
- k) Refrigerators and freezers used for the storage of flammable liquids must be non sparking
- l) Ensure that there is proper bonding and grounding when transferring between metal containers or dispensing a flammable liquid from a large container or drum.
- a) Laboratory coats must be worn at all times when using hazardous chemicals.
- b) Where there is a risk of a hazardous chemical splashing into the eyes, safety glasses must be worn with side protection. Ordinary corrective spectacles do not provide sufficient protection. Staff who wear spectacles will be provided with safety glasses that fit over their own glasses or prescription safety glasses.
- c) Staff must ensure that students wear appropriate eye protection.
- d) Contact lens wearers should alert staff to that fact so that appropriate first aid can be provided in the event of an eye injury.
- e) Staff should ensure that the correct type of gloves are selected for work with hazardous chemicals. Latex gloves do not provide sufficient protection.

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3.1.2.3 Safety Equipment

- a) Where emergency showers or eyewash basins are installed, these must be tested at least once per term.
- b) It is good practice to operate the eye wash station at least once per week.
- c) Eye wash bottles must be checked regularly to ensure they are in date. If the seal is broken the bottle must be replaced.
- d) Fume hood efficiency and other local exhaust ventilation will be tested on an annual basis by technical staff.

3.1.2.4 Spillage procedures

The following general rules can be applied to the extent necessary to deal with any spillage without danger to the operators involved or to the environment. These should be supplemented with advice from the chemical suppliers, SDS or from the relevant local authorities.

- a) Wear lab coat, gloves and safety glasses when cleaning up spillages.
- b) Clear other staff or students from the area.
- c) Open windows.
- d) Eliminate all sources of heat and ignition for all flammable materials and also for those which form more toxic substances on exposure to heat.
- e) Liquid spills can be treated in several ways:
- f) If small, absorb on paper towels and evaporate in a fume cupboard.
- g) If large, absorb on sand, vermiculite or chem-sorb / saffire (industrial absorbent for liquid spills, available in all the laboratories), put into a covered container and remove for disposal. Spill kits are available in each lab.
- h) Most solid materials should be swept up dry or mixed with dry sand before being swept up and placed in buckets for removal and subsequent disposal.
- i) Any contaminated personal or protective clothing should be thoroughly cleaned to remove all traces of contaminant. In some cases it may be necessary to discard contaminated clothing.

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- j) Each spillage incident should be reported to the Chief Technical Officer so that it can be thoroughly investigated to prevent further similar incidents and also to ensure that the instructions for handling such incidents are satisfactory.

Acid spills

- a) Apply neutraliser (or sodium bicarbonate) to the perimeter of the spill.
- b) Mix thoroughly until fizzing and evolution of gases ceases. It may be necessary to add a small amount of water to the mixture to complete the reaction as neutraliser has a tendency to absorb acid before fully neutralising it. Do not add the water first.
- c) Check with pH indicator paper that the acid has been neutralised.
- d) Transfer the mixture to a strong plastic bag, tie shut and label.
- e) Place in a fume hood until disposal can be arranged.

Caustic spills

- a) Apply neutraliser to the perimeter of the spill.
- b) Mix thoroughly until fizzing and evolution of gases ceases.
- c) Check with pH indicator paper that the caustic has been neutralised.
- d) Transfer the mixture to a strong plastic bag, tie shut and label.
- e) Place in a fume hood until disposal can be arranged.

Solvent spills

- a) Apply activated charcoal or industrial absorbent e.g. saffire / chemsorb to the perimeter of the spill.
- b) Mix thoroughly until material is dry and no evidence of liquid solvent remains.
- c) Transfer absorbed solvent to a plastic bag (if compatible), tie shut and label.
- d) Place in a fume hood until disposal can be arranged.

3.1.2.5 Spillage onto the person

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- a) In the case of spillage onto the skin, affected areas of the skin should be immediately treated with copious quantities of water and any contaminated clothing removed. It is good practice to follow the initial water sluice by washing with soap and water.
- b) In the case of spillage into the eyes; the victim may have no vision to assist him/herself and is usually in a very anxious state. The eyes should be well washed, either with water or some suitable eye lotion, by the victim's colleagues. Firm instructions to open the eyes for treatment and gentle restraint are normally needed. Entry of dangerous materials into the eyes should always be treated as a matter of concern and hospital examination should always follow the emergency first-aid procedure.
- c) Any person requiring emergency first-aid treatment, after initial treatment (preferably by a trained first-aider) should be brought to the Medical Centre who will advise if further hospital treatment is required. It is important that medical staff are informed of the nature of the accident, the time at which it occurred and the chemicals involved.

3.1.2.5 Disposal of waste chemicals

Accurate identification and classification is the first step in proper handling and disposal of laboratory chemicals / material that have become waste. One should also aim to keep all waste to an absolute minimum. Always check with the person in charge of the laboratory what the procedures are for dealing with the different categories of waste.

- a) When purchasing chemicals regard should be paid to how waste will be disposed of. Volumes purchased should be kept to a minimum to prevent the build up of surplus chemical for disposal.
- b) Waste chemicals must be labelled with the chemical name(s), concentration and hazard warning label as well as the name of the person responsible for production/disposal of the waste.
- c) Flammable wastes should be stored in a flammables cabinet.
- d) Do not dispose of hazardous waste down the drains.
- e) Avoid mixing heavy metal waste and used oil with waste solvents.
- f) Do not mix aqueous waste with organic solvent- based waste.
- g) Paper, gloves, cardboard, and other solid materials must not be mixed in with liquid wastes.

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- h) Hazardous waste must not be allowed to accumulate in labs. Arrange for disposal with Chemistry Department on a regular basis.
- i) Chemical waste can be mixed only if the chemicals are compatible and will not result in a hazardous reaction.

Wastes for disposal should be divided into the following categories;

- a) Acids
- b) Caustics
- c) Chlorinated Solvents
- d) Non-chlorinated Solvents
- e) Mercury Wastes
- f) Oxidizing Agents
- g) PCB Wastes
- h) Reactive Chemicals
- i) Waste Oil
- j) Wastes with Heavy Metal Contamination
- k) Hydrofluoric Acid Waste.

The proper segregation of waste chemicals is essential to promote safe storage of those chemicals as well as to facilitate the economical disposal of the chemicals.

Avoiding smells from drains.

- a) Much distress can be caused by smells from drains due to volatile solvents and smelly substances entering the drains.
- b) Please think about what is going down your drain - especially drains in fume-hoods as you may be unaware of the smell that is escaping.
- c) Technical staff should make sure that sink and drain traps are refilled regularly with water to prevent drain odours escaping

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3.2 Fire

Control

- Fire extinguishers are in place and are serviced regularly. Do not remove them from their positions.
- Training will be provided in the use of fire extinguishers.
- Cardboard boxes and other rubbish must not be allowed to accumulate in storage areas
- Smoking is not allowed in the building.

3.2.1 NORMAL HOURS EMERGENCY EVACUATION PROCEDURES:

A ON THE DISCOVERY OF A FIRE :

(a) Raise the alarm by breaking the nearest available break glass point.

(b) Phone extension **3333**. The appropriate emergency service will then be contacted immediately.

(c) If the fire is small and contained staff should consider using the nearest appropriate appliance provided, ensuring that the extinguisher is compatible with the fire e.g. **do not use water on electrical or flammable liquid fires.**

B ON HEARING A CONTINUOUS ALARM :

Evacuate the building in the following manner :

(a) WALK (do not run) to the nearest exit point briskly.

(b) Do NOT delay to pick up personal belongings. This could hinder evacuation of the building and put not only your own life in danger but also the lives of others.

(c) Disconnect all electrical appliances.

(d) Close all doors behind you (where practical).

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- (e) Do not use lifts. In the event of an emergency, electrical connections to lifts are disconnected.
- (f) **DO NOT RESTRICT EGRESS BY CONGREGATING IN THE STAIRWELLS.**
- (g) Assemble at the assembly point designated for the building. It is important to assemble at this assembly point, following the routes clearly marked, to avoid congestion and to allow unhindered access to the emergency services.
- (h) During the evacuation and on arrival at the designated assembly points it is essential to follow the stewards instructions as they endeavor to keep adjacent areas clear.
- (i) Do NOT re-enter the buildings until authorized by the assembly point steward.
- (j) To relieve congestion on re-entering the building, it is important to use the same route by which you entered.

3.2.2 OUTSIDE NORMAL WORKING HOURS :

A ON THE DISCOVERY OF A FIRE :

- (a) Raise the alarm by breaking the nearest available break glass point.
- (b) Phone extension **3333**. The appropriate emergency service will then be contacted immediately.
- (c) If the fire is small and contained staff should consider using the nearest appropriate appliance provided, ensuring that the extinguisher is compatible with the fire e.g. **do not use water on electrical or flammable liquid fires.**

B ON HEARING A CONTINUOUS ALARM :

Evacuate the building in the following manner :

- (a) WALK (do not run) to the nearest exit point briskly.

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- (b) Do NOT delay to pick up personal belongings. This could hinder evacuation of the building and put not only your own life in danger but also the lives of others.
- (c) Close all doors behind you (where practical).
- (d) Do not use lifts. In the event of an emergency, electrical connections to lifts are disconnected.
- (e) Assemble at the assembly point designated for the building. Await instructions of security staff.
- (f) Do NOT re-enter the buildings until authorised by the security staff.

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3.3 Electricity

Hazards

Electric Shock

Fire

Trips or falls from loose cables.

Risk Assessment High

Control Measures

- If for any reason there is an electrical fault the Department, Buildings & Estates should be immediately contacted to remedy the matter.
- Under **no** circumstances should staff or students attempt to carry out repairs either temporary or permanent to the electrical supply system.
- The Department, Buildings & Estates will ensure that the wiring installation to the building is checked by a competent qualified electrician. Dangerous or defective material should be replaced or remedied in accordance with the E.T.C.I.'s rules.
- Electrical equipment in the Department must be repaired and serviced by a competent person.
- Any specialist equipment manufactured or formulated for experimental purposes must comply with the E.C.T.I.'s rules as far as is reasonably practicable.
- Before modifying circuits, switch off and disconnect from mains. If live circuits must be tested, properly sheathed probes must be used. Ensure there is a second person in the room when working with voltages higher than the mains.

WIRING STANDARDS - EQUIPMENT AND MACHINERY

- All new fixed and temporary wiring will be to the latest Irish standards and, where practicable, in compliance with the national rules for electrical installations.
- Portable or temporary equipment will be connected by means of switched socket outlets suitable for the environment.

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- Flexible cables will also be adequately protected against external mechanical damage.
- Adequate fusing or excess protection, e.g. circuit breakers, must be provided for all fixed and portable equipment and regularly maintained.
- Sufficient sockets shall be provided to prevent overloading by use of adaptors. Proper plugs shall always be fitted to electrical appliances and flex firmly clamped.
- Frayed and damaged cables shall be replaced immediately.

Reference

National Rules for electrical installations issued by the Electro-Technical Council of Ireland.

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3.4 Housekeeping

Hazards

Slips, trips and falls
Fire
Vermin

Risk Assessment - Low

Control Measures

- All pedestrian traffic routes in Departmental laboratories and offices must be kept clear at all times, this includes stairs, corridors doorways and any other routes inside a room.
- All waste materials must be cleared away as the accumulated or as soon as possible and disposed of in the correct manner.
- Combustible materials (such as paper) must not be stored under stairs
- All spillages must be cleaned up immediately
- All wiring must be routed so that it does not cause a trip hazard. Put it overhead where possible or route it around the walls.
- Food should not be consumed in laboratories. All food waste must be properly disposed of.

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3.5 Use of equipment for teaching /research

There is a large and varied amount of equipment in use in the department. Much of this is specialised equipment

Risk Assessment – Medium- High

Control Measures

- Student must not use any equipment unless they have been trained and authorised to do so.
- Equipment must only be used for the intended purposes of teaching /instruction/research.
- All defects in equipment must be reported to the technicians or the academic staff member in charge of the equipment.

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3.6 Storage of chemicals (in chemical store)

Hazards

Fire/explosion
Burns

Risk Assessment – High

Control Measures

- The safety data sheets (SDS's) must be available in the chemical store for all chemicals stored there
- Chemical which react to produce dangerous fumes, fire, explosion must be segregated.
- Scheduled poisons and substances of high toxicity must be kept in a locked cupboard or store and must be checked regularly. Experiments involving poisons must have procedures in place to deal with the eventuality of things going wrong.
- All liquids must be stored in secure robust containers such as Winchesters. A suitable means for transporting Winchesters must be available such as baskets. Winchesters must never be carried by the neck.
- Flammable liquids must be kept in a proprietary fireproof cabinet. This should have a bund at the bottom and all shelves should have a lip all the way around to contain small spills.

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3.7 Waste storage

Hazards

Fire/explosion
Burns

Risk Assessment – High

Control Measures

- All waste must be kept in clearly marked bottles/containers
- Waste chemical must be segregated according to chemical incompatibilities (see appendix 2)
- Waste bottles should not be filled above shoulder level
- Waste chemical should not be mixed unless the risk of incompatibilities has been assessed and it is safe to mix them

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3.8 Recharging the acid and alkali in the ion exchange resins

Hazards

Acid/alkali burns

Manual handling

Risk Assessment – High

Control Measures

- Consult the SDS for all chemicals involved in recharging the ion exchange resins and follow all instruction set out such (as correct PPE).
- All lifting of chemical containers must be carried out according to the correct manual handling procedures. Mechanical lifting aids should be used (such as wheel mounted tilting liquid containers).
- All spill must be cleaned up immediately

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3.9 Lasers

Hazards

Eye damage
Skin damage
Fire

Risk Assessment – High

Lasers can cause damage in a number of ways the eyes are particularly vulnerable. The degree of danger of the use of lasers is related to the class of laser involved. BS 4803:1983 classifies laser into categories. Class 1 and class 2 lasers are the safest; the blink reflex normally provides sufficient protection. Class 3A lasers also are normally safe due aversion responses such as the blink reflex, however they are more powerful and optical aids may result in damage. Class 3B and class 4 lasers are more powerful and much greater care is required in using them.

The degree of hazard is determined by the wavelength, pulse duration or exposure time the tissue at risk and for radiation in the 400nm-1400nm wavelength the size of the retinal image. Devising a safe system of work for the use of class 3 and class 4 lasers must be determined on an individual basis.

Risk Assessment – High

Control Measures

- Only authorised competent people are to use laser equipment
- All laser equipment must comply with BS4803: 1983:Radiation safety of laser products and systems.
- Use of class 2 and higher lasers must be carried out in dedicated areas with warning notices to other people who may be in the area
- Access to the areas where lasers are being used must be restricted to people directly related in the work.

Class 3A 3B and 4 lasers

- All work with these lasers must be subjected to a specific risk assessment
- All protective equipment such all blackout curtains must be used
- Use of class 3 and higher lasers must be carried out in dedicated areas with warning notices to other people who may be in the area

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- Access to the areas where lasers are being used must be restricted to people directly related in the work.
- Eye protection must have the operating wavelength and optical density of filtering at that wavelength clearly marked on it.
- The potential for exposure to laser radiation by reflection (from surfaces in the room) must be determined and controlled.
- These lasers must have a visible (with eye protection worn) and and/or audible warning when it is switched on and operating.

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3.10 Liquid Nitrogen

All cryogenic fluids are liquefied gases, some of which embrace the hazards of flammability, irritancy, corrosivity, toxicity and the vigorous support of combustion. Contact with cryogenic fluids or equipment can result in frostbite, or torn flesh, injuries which are just as unpleasant as high temperature burns. Prolonged inhalation of cold vapour or gas should also be avoided.

Hazards

- Liquid nitrogen can cause severe frostbite.
- On vaporisation it expands by a factor of 700. This can cause explosion of a sealed container, or it can displace oxygen in the room and cause suffocation without warning.
- It can become oxygen enriched and cause ordinarily non-combustible materials to burn rapidly.

Risk Assessment: Low - Medium

Control

- a) Take care not to allow liquid nitrogen to be trapped in clothing near the skin.
- b) Wear safety glasses or a face shield when transferring liquid nitrogen.
- c) Wear gloves when touching any object cooled by liquid nitrogen. Gloves should be loose fitting, so they could be thrown off if liquid were to pour inside them
- d) Use only approved unsealed containers. Never pour it into a thermos flask. Never seal it in any container (it will explode).
- e) Never dip a hollow tube into liquid nitrogen; it may spurt liquid.
- f) Never use in a small poorly ventilated room, and never dispose of liquid nitrogen by pouring it on the floor. It could displace enough oxygen to cause suffocation. Nitrogen gas is colourless and odourless-the cloud that forms when you pour liquid nitrogen is condensed water vapour from the air, not nitrogen gas.
- g) Do not store liquid nitrogen for long periods in an uncovered container (on the other hand, never totally seal a container). Because the boiling point of oxygen is above that of nitrogen, oxygen can condense from the air into the liquid nitrogen. If the air over the nitrogen circulates, this liquid oxygen can build up to levels that may cause violent reactions with organic materials;

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even materials that are ordinarily non-flammable. For example, a severe clothing fire could result from ignition in the presence of liquid oxygen.

- h) Do not transport liquid nitrogen in a passenger lift accompanied by people because in the event of lift failure oxygen deficiency could occur and lead to asphyxia.
- i) Training is needed in filling containers so this should never be attempted unless accompanied by a trained laboratory attendant or technician.

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3. 11 Manual handling

Hazards

Back injuries

Risk Assessment – High

Control Measures

- The manual handling of materials or equipment will be avoided as much as possible by advance planning.
- Mechanical lifting devices (such as trolleys and pallet trucks) and aids will be used wherever possible.
- Staff will be trained in the correct manual handling techniques
- Basic guidelines for lifting are presented below. These are not a substitute for formal manual handling training.

Good Lifting Technique Guidelines

- a) Plan the lift: determine the weigh of the load and the path to be taken, remove obstructions, check the underfoot conditions.
- b) Place the feet: have the feet apart to make a firm and stable base.
- c) Adopt a good posture: bend the knees, keep the back straight (tucking the chin into the chest while gripping helps), keep the shoulders level and facing the same direction as the hips (never twist at the hips while lifting or carrying a load).
- d) Get a firm grip: get a firm grip on the load, try to keep the arm within the boundary formed by the legs.
- e) Do not jerk the load: lift smoothly
- f) Move the feet: do not twist the trunk
- g) Keep the load close: keep the load close to the torso
- h) Put down then adjust: slide the load into position after putting it down.

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3. 12 Pillar drill

Hazards

Ejected material such as swarf
Electrical shock/fire
Hand and arm injuries
Entrapment in rotating parts

Risk Assessment – High

Control Measures

- a) The pillar drill will be maintained by the relevant technician in a safe condition for use. Records of all maintenance will be kept by the technician.
- b) Only competent authorised people are allowed to use the drill. Users must have the permission of the technician in charge of the drill or the head technician before they can use it.
- c) Eye protection will be worn when using the drill
- d) All loose clothing must be tied up when using the drill. Sleeves must be tight fitting. All jewellery which could get caught by rotating head must be removed. Long hair must be tied up to prevent it getting tangled with the rotating head of the machine.

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APPENDIX 1 ECE First Aid Facilities

Room No	Title	First Aid Box	500ml Eye Wash	Fire Blanket
A2011	Electronic Engineering	X	X	
A2012	ECE PC Laboratory	X	X	
B2043	BSc UG Computing	X	X	
B2042	BE UG Computing	X	X	
B2014	Office	X	X	
B2011	Control Lab	X	X	
B2006	FYP Lab	X	X	
B2007	Artwork Room		X	
B2008	PCB Lab		X	X
B2006c	Soldering Room		X	
C2051	Optical Fibre Sensors	X	X	
C2049	Solid State Lab	X	X	X
C2054	Mask Making Lab	X	X	X
C2047	Semi-Clean Room	X	X	X
C2055	Semiconductor PG Lab	X	X	
C2057	Peer Support	X	X	
D2037	Biomedical Electronics	X	X	
D2031	Office	X		
D2021	Office	X		
E2014	Office	X		
E2006	Digital Speech	X	X	
E2004	Optical Fibre PG lab	X	X	
E2002	Optical Communications	X	X	
E2001	Telecommunications Postgrad Research Area	X		
C0045	Robotics/Anechoic	X	X	
ER2029	Engineering Research	X	X	

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APPENDIX 2

Substances in the left hand column should be stored and handled so they cannot possibly accidentally contact corresponding substances in the right hand column under uncontrolled conditions, when violent reactions may occur.

Alkaline and alkaline earthmetals, such as sodium potassium, lithium, magnesium, calcium, powdered aluminium	Carbon dioxide, carbon tetrachloride, and other chlorinated hydrocarbons. (Also prohibit water, foam, and dry chemical on fires involving these - metals - dry sand should be available)
Acetic Acid	Chromic acid, nitric acid, hydroxyl - containing compounds, ethylene glycol, perchloric acid, peroxides, and permanganates.
Acetone	Concentrated nitric and sulphuric acid mixtures
Acetylene	Chlorine, bromine, copper, silver, fluorine and mercury
Ammonia (anhyd.)	Mercury, chlorine, calcium hypochlorite, iodine, bromine and hydrogen fluoride
Ammonium Nitrate	Acids, metal powders, flammable liquids, chlorates, nitrites, sulphur, finely divided organics or combustibles.
Aniline	Nitric acid, hydrogen peroxide.
Bromine	Ammonia, acetylene, butadiene, butane and other petroleum gases, sodium carbide, turpentine, benzene, and finely divided metal.
Calcium oxide	Water
Carbon, activated	Calcium hypochlorite
Copper	Acetylene, hydrogen peroxide
Chlorates	Ammonium salts, acids, metal powders, sulphur, finely divided organics or combustibles
Chromic acid and Chromium	Acetic acid, naphthalene, camphor, trioxide glycerine, turpentine, alcohol, and other flammable liquids.
Chlorine	Ammonia, acetylene, butadiene, butane and other petroleum gases, hydrogen, sodium carbide, turpentine, benzene, and finely divided metal.
Chlorine dioxide	Ammonia, methane, phosphine, and hydrogen sulphide.
Fluorine	Isolate from everything.
Hydrazine	Hydrogen peroxide, nitric acid, and other oxidant
Hydrocyanic acid	Nitric acid, alkalis

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Hydrogen peroxide	Copper, chromium, iron, most metals or their salts, any flammable liquid, combustible materials, aniline, nitromethane.
Hydrofluoric acid, anhyd. (hydrogen fluoride)	Ammonia, aqueous or anhydrous.
Hydrogen sulphide	Fuming nitric acid, oxidising gases.
Hydrocarbons (benzene butane, propane, gasoline, turpentine, etc.)	Fluorine, chlorine, bromine, chromic acid, peroxide
Iodine	Acetylene, ammonia, (anhyd. or aqueous)
Mercury	Acetylene, fulminic acid* ammonia
Nitric Acid (conc.)	Acetic acid, acetone, alcohol, aniline, chromic acid, hydrocyanic acid, hydrogen sulphide, flammable liquids, flammable gases, and nitratable substances.
Nitroparaffins	Inorganic bases.
Oxygen	Oils, grease, hydrogen, flammable liquids, solids, or gases
Oxalic acid	Silver, mercury
Perchloric acid	Acetic anhydride, bismuth and its alloys, alcohol, paper, wood, grease, oils
Peroxides, Organic	Acids (organic or mineral) avoid friction, store cold
Phosphorus (white)	Air, oxygen
Potassium chlorate	Acids (see also chlorate)
Potassium perchlorate	Acids (see also perchloric acid)
Potassium permanganate	Glycerine, ethylene glycol, benzaldehyde, sulphuric acid.
Silver	Acetylene, oxalic acid, tartaric acid, fulminic acid, * ammonium compounds.
Sodium	See Alkaline metals (above)
Sodium Nitrite Compounds	Ammonium nitrate and other ammonium compounds
Sodium peroxide	Any oxidizable substance, such as ethanol, methanol, glacial acetic acid, acetic anhydride, benzaldehyde, carbon disulphide, glycerine, ethylene glycol, ethyl acetate, methyl acetate and furfural.
Sulphuric acid	Chlorates, perchlorates, permanganates

* produced in nitric acid - ethanol mixtures