

## Laboratory and Workshop Regulations NES

The Laboratory Regulations serve the purpose of ensuring general safety and proper procedures during all work performed in laboratory and workshop areas.

The Safety Regulations apply to all persons working at the *Institute of Networked and Embedded Systems* and are to be understood as directives in terms of § 14 of the Employee Protection Act. Acknowledgement of these Laboratory and Workshop Regulations must be confirmed by signature.

The laboratory and workshop regulations apply to all premises of the Institute of Networked and Embedded Systems.

### 1 Safety Regulations

Laboratories are defined as "electrical operating rooms" in accordance with the Regulations of the Austrian Electrotechnical Association (ÖVE). Working in the laboratory is prohibited without appropriate prior instruction.

The University of Klagenfurt is not legally liable for damage to persons or property proved to have been caused by gross negligence or deliberate action. Compensation claims against the University or the Institute are ruled out.

- 1.1 All members of the university are obliged to take note of and observe the General and Fire Safety Regulations.  
Link: <https://intranet.aau.at/download/attachments/544014440/General%20and%20Fire%20Safety%20Regulations.pdf?api=v2>
- 1.2 Every individual is obliged to familiarize him/herself with the location of fire extinguishers, first-aid kits and further security facilities. An overview thereof is attached to these Regulations. Further information is available from the university's safety officer.
- 1.3 All safety instructions and measures must be followed and supported. Instructions which are contrary to these Safety Regulations must not be followed.
- 1.4 Working in the laboratory and workshop areas is prohibited without prior instruction concerning the specific risks and appropriate conduct in the relevant domain (electricity/electronics, robotics, hydraulics/pneumatics and mechanics).
- 1.5 Instruction shall be given by the person appointed for this purpose with the support of the relevant documentation.
- 1.6 Knowledge of the rules listed under points 2 to 9 below does not replace instruction as defined above.
- 1.7 Before starting work in the laboratory or workshop areas, all employees, students and interns must confirm in writing that instruction has taken place.

## 2 Regulations for working with electrical and electronic systems

2.1 Before it is switched on, all employees, students and interns have to familiarize themselves with the construction and method of operation of an electrical set-up as well as with the operating instructions of the equipment used. Furthermore, they are obliged to inform themselves of exactly how the entire set-up can be switched off rapidly, i.e. they must know where the "emergency shut-down button" is located for every individual electric circuit.  
The functionality of the "emergency shut-down button" must be checked at regular intervals.

2.2 All employees, students and interns have to observe the following safety regulations when working with electrical equipment and installations:

### **The five safety rules:**

- Disconnect completely from power supply, switching off all poles!
- Secure against re-connection!
- Check for complete absence of voltage!
- Carry out earthing and short-circuiting!
- Provide protection against adjacent live parts (cover or fence off)!

Once work has been completed, these measures are reversed analogously.

2.3 Before using electrical equipment or installations, ensure that they are in perfect working order.

2.4 Only use the switches and settings intended for this purpose. Settings on safety contrivances must not be changed.

2.5 As a matter of principle, do not use electrical equipment or installations when they are wet. Similarly, do not use equipment if your hands or your feet are wet.

2.6 Switch off the power supply as soon as a malfunction occurs.

2.7 Do not attempt to repair electrical equipment and installations if you do not possess adequate knowledge of the associated dangers and how to work safely.

2.8 Before using electrical devices which are fixed or moveable, familiarize yourself with any special safety measures and adhere to these safety measures strictly, particularly when the equipment is being used in a special environment, e.g. extreme heat, cold, chemical influences or in areas at risk of fire or explosion.

2.9 If equipment or auxiliary devices are found not to be in perfect working order in line with the safety regulations, the defect must be reported immediately to the appropriate employee. The equipment or installations must not to be used anymore; other persons must be prevented from using them and attention must be drawn to possible dangers.

2.10 Changes in the construction of electric circuits and systems must only be carried out when voltage-free. Circuits which are live should not be left unattended. Should this not be possible, a warning sign must be affixed. Sufficient protection against accidental contact must be ensured.

2.11 When working with voltage above 50 V, with uninsulated equipment, control boxes or on experimental set-ups with uninsulated mains connections, or with equipment for which the protective measures preventing too high a contact voltage in accordance with ÖVE E8001/NIV/NIN (VDE 0100) have been temporarily switched off for measurement purposes, this is only allowed when a second person is present in the laboratory area. When working with circuits with operating voltages above 50 V, protective measures are to be applied in accordance with the Regulations of the Austrian Electrotechnical Association (ÖVE). In such circuits, it is forbidden to make any changes to the circuit while the set-up is live. Before making any such changes, the main switch must be used to disconnect the experimental set-up from the operating voltage.

Then, the person who intends to make changes to the circuit has to personally make sure that the circuit is voltage-free. Under no circumstances should uninsulated live circuit components be touched when the set-up is switched on. Outside normal operating hours, at least one skilled employee must be present in the above-mentioned cases.

- 2.12 Specific regulations for the prevention of accidents (UVV) and operating instructions are to be observed.

### **3 Regulations for working in laboratory areas**

- 3.1 Persons who do not belong to the *Institute of Networked and Embedded Systems* may only enter the laboratory area with the explicit permission of one of the institute's employees.
- 3.2 Ear protection must be used when noise levels are high.
- 3.3 The laboratory areas and their equipment must always be kept clean and tidy; particularly after work has been completed, laboratory workstations are to be tidied up and the doors must be locked.
- 3.4 Smoking in laboratory areas is prohibited.
- 3.5 Systems operating automatically must not be left unattended.
- 3.6 It is prohibited to linger in danger zones.
- 3.7 Observe the relevant operating instructions.
- 3.8 Safety equipment must not be removed, altered or deactivated. Installations with faulty safety equipment must not be set in operation.

### **4 Regulations for working with hydraulic and pneumatic systems**

- 4.1 The general regulations which apply to constructing and operating hydraulic and pneumatic systems are to be observed.
- 4.2 Only competent and expert employees may carry out work on hydraulic systems.
- 4.3 Regulations for the prevention of accidents (UVV) and operating instructions are to be observed.

### **5 Regulations for working in mechanical workshop areas**

- 5.1 Machine tools must only be used after thorough instruction and in the presence of a second person. The appropriate personal protective clothing is to be worn.
- 5.2 Regulations for the prevention of accidents (UVV) and operating instructions are to be observed.

### **6 Regulations for working with drones**

- 6.1 The laboratory regulations and operating instructions must be observed without exception.
- 6.2 Only trained specialists are authorized to operate the drones.
- 6.3 The operating instructions BA-23 *Model flight with drones* must be observed.

- 6.4 Indoor flights may only be performed in the designated area separated by nets. Before the drones are put into operation, the pilot(s) must ensure that the airspace is properly secured by the nets. The nets must be regularly inspected to ensure that they are in a sound condition.
- 6.5 The drones may only be launched and operated if there are no persons or other obstacles in the restricted area that could lead to a collision.
- 6.6 The pilot is prepared at all times to shut down the drone in an emergency. Emergency shut-down (flight controller off, engine off).
- 6.7 All controls must be positioned outside the flight level.
- 6.8 The operating instructions BA-39 *regarding the handling of lithium batteries (Li-ion or Li-polymer batteries)* must be observed. The batteries may only be installed within the drone during operation. The batteries must be stored safely.
- 6.9 Keep hands away from the rotor blades during operation. Use protective gloves and goggles when adjusting the device. Use headgear or hairnet to cover long hair.
- 6.10 In the case of outdoor flights, the legal regulations must be observed and the appropriate permits must be obtained in good time.
- 6.11 Protection or safety contrivances on the drone must not be removed.
- 6.12 If equipment, installations or auxiliary devices are found not to be in perfect working order in line with the safety regulations, the defect must be reported immediately to the appropriate employee. The equipment or installations must not to be used anymore; other persons must be prevented from using them and attention must be drawn to possible dangers.
- 6.13 The operating instructions and safety regulations provided by the equipment manufacturers must be observed and complied with.

## **7 General Regulations**

- 7.1 When working with equipment with rotating shafts, close-fitting clothing should be worn. It is forbidden to wear jewellery (necklaces, bracelets, rings, etc.).
- 7.2 Before leaving the workstation, all equipment must be unplugged. Pneumatic and hydraulic installations in particular must be switched off and depressurized.
- 7.3 The laboratory and workshop areas and all equipment must always be kept clean and tidy; particularly when work has been completed, laboratory workstations are to be tidied up, the windows must be closed and doors locked.
- 7.4 As a general rule, any warning and information signs must be observed.

## **8 Computers, equipment and tools**

- 8.1 Computers, equipment and tools are to be handled carefully. Any damage to these must be immediately reported to the appropriate employee. Users are liable to pay full compensation for any damage caused by gross negligence or deliberate action.
- 8.2 After use, all equipment and tools must be returned to their proper storage sites. If an installation is in operation throughout several days, a notice must be affixed to this effect.

- 8.3 It is forbidden to install or uninstall software on laboratory or workstation computers unless your supervisor has given you explicit permission to do so.

## **9 Components, materials and orders**

- 9.1 All materials must be treated carefully and used in such a manner that there is no unnecessary waste.
- 9.2 When using electric, electronic, pneumatic and hydraulic components, their technical specifications must be observed. Components which are damaged due to gross negligence or deliberate action must be paid for.
- 9.3 When taking components or other materials from storage, inform the appropriate employee when stocks are running low.

## **10 Attachments to the Laboratory and Workshop Regulations**

### **Fire extinguishers**

#### B02, ground floor

- near B02.0.02 – carbon dioxide extinguisher
- near B02.0.06b – water extinguisher (near the entrance to Family Services)

#### B02, first floor - west

- near B02.1.07 – water extinguisher
- near B02.1.10 – carbon dioxide extinguisher
- near B02.1.11 – water extinguisher

#### B02, first floor - east

- near B02.1.56 – water extinguisher
- near B02.1.58 – carbon dioxide extinguisher
- near B02.1.61 – water extinguisher

#### B04, first floor - west

- near B04.1.06 – water extinguisher
- near B02.1.02 – carbon dioxide extinguisher
- near B02.1.04 – water extinguisher

#### B04, second floor - west

- near B04.2.115 – water extinguisher
- near B04.2.113 – carbon dioxide extinguisher
- near B04.2.111 – water extinguisher
- near B04.2.209 – water extinguisher

#### B10, second floor - west

- near B10.2.012 – water extinguisher
- near B10.2.201 – carbon dioxide extinguisher
- near B10.2.023 – water extinguisher

#### B13 drone hall

- near north exit – carbon dioxide extinguisher
- near south exit – foam extinguisher

## First aid kits

- in the staff kitchen B02.0.02
- in the staff kitchen B02.1.68
- in the staff kitchen B04.2.120
- in the staff kitchen B04.1.118
- in the staff kitchen B10.2.14
- in the drone hall Room No. B13b

## Defibrillator

Porter's office	main entrance Z building	Level 1	Z.1.31
Southern Wing	Adjacent to lift	Level 1	
Vorstufe Building	main entrance Vorstufe building	Level 1	
Mensa	in the corridor in front of lecture hall 6	Level 1	
Lakeside Block 2	in the corridor near the entrance to Family Services	Level 0	

## Escape chair (emergency evacuation chair)

B02 2.OG

- near B02.2.57

B04 2.OG

- near B04.2.113



## Eye wash station

- At the porter's office

## Emergency responders

Arneitz	Fred	IST	B04.2.119	3574
Korenjak	Annemarie	IST	B04.2.122	3550
Puschl	Klothilde	IST	B04.2.206	3565
Theer	Holger	IST	B04.2.119	3566
Vogell	Arke	NES	B02.1.03	3648
Lienbacher	Kornelia	NES	B02.1.07	3640
Daniel	Neuhold	NES	B02.1.08	3855
Schauer	Angelika	NES	B10.2.015	3642
Oppelmayer	Anna	ÖBWL	B10.2.021	4136

## **Department of Building and Technical Services**

- GT-Hotline ext. 9108
- Head of department Judith Biedermann ext. 9106

### **Safety officer**

- Strohmaier Gloria ext. 6195
- Deputy: Spitzer Josef ext. 9253

### **Fire safety officer**

- Marlene Starc ext. 3505

Occupational health & safety documentation and operating instructions are available online:  
<https://intranet.aau.at/display/ARBEITNEHMERSCHUTZ/ArbeitnehmerInnenschutz>

(only available in German)

## Hazards for Persons and the Environment



- Working outdoors - sunburn
- Risk of injury from rotating blades
- Uncontrolled flight due to failure of the control system
- Unsecured moving parts – risk of hair being caught
- Formation of dust at start-up

## Safety Precautions and Rules of Conduct



- For outdoor protection use UV-safety glasses, a head covering, and sun cream
- Secure long hair with a head covering or a hair net
- Use safety glasses at start-up to protect against the formation of dust
- Select the surface area of the installation location carefully
- Wear safety footwear in wintertime
- Observe the standard operating procedure for „Working outdoors in hot weather“ on days when the temperature is high

## Conduct in the Case of Malfunction and in Hazardous Situations

- Press the *Emergency Button* if the control system malfunctions
  - disconnect the power supply, if it can be done safely

## First Aid – Emergency Number 144



Emergency responders: see list of emergency responders

## Maintenance

- Repairs on the model flying objects must only be carried out by qualified experts



Area:

## Scope of application

**These operating instructions apply to the handling of lithium batteries (Li-ion or Li-polymer batteries).**

## Hazards for people and the environment



Mechanical, thermal or electrical strains (e.g. impact, heat, cold, incorrect charging, short-circuit of the poles) can cause severe damage to the battery, leading to:



- leakage of corrosive liquid, combined with possible skin irritations, burns, and chemical burns
- an increased risk of fire due to leakage of the electrolyte (combustible solvent)
- an escape of toxic substances or combustion products in the event of a fire
- danger due to high charging currents when re-charging the Li-ion batteries!
- discharge currents, in particular in the event of (inadvertent) short-circuits

## Protective measures and code of conduct



- Only authorized and trained persons may handle Li-Po batteries
- Observe the operating instructions / safety data sheet of the manufacturer
- Never leave Li-Po batteries unattended when charging
- Protect against mechanical strain (impacts, falls, vibrations)
- Protect battery poles against short-circuiting
- Do not expose Li-Po batteries to direct and permanent high temperatures – store in a cool and dry place
- Regularly check Li-Po batteries for damage: If signs of smoke-, heat-, odour-, or noise-development or any deformations are noticeable, disconnect the accumulator from the unit and immediately place it in a safe place of storage (e.g. a fire-resistant container or at a safe distance to combustible materials). Further handling only with suitable personal protective equipment.
- Storage and re-charging in fireproof or spatially separated rooms or areas
- Do not store Li-Po batteries near combustible materials (safety distance: at least 2.5 m)
- Mixed storage with other products is not permitted
- Ensure adequate ventilation of the storage area
- During charging, place the battery in a fireproof basin or on a fireproof tray
- Only use chargers approved by the manufacturer
- Avoid excessive charging voltages and over-charging
- Use personal protective equipment if required (incl. facial protection, suitable gloves)
- Provision of suitable fire extinguishers (foam or CO<sub>2</sub> extinguishers)
- Immediate correct disposal of defective Li-ion batteries

## Conduct in the event of malfunctions



### Faults during charging:

- In the event of operational malfunctions, turn charger off immediately
- Pull out the plug; if it is safe to do so, disconnect the Li-Po battery
- Report the identified faults to the supervisor immediately

### Removal of leaked fluids:

- Wear protective goggles, alkali-resistant gloves and, if required, solvent-resistant protective clothing
- Wipe up leakages with a dry, absorbent textile cloth and dispose of this separately as hazardous waste at a special waste collection point in line with national regulations
- Do not inhale fumes



### In the event of fire:

- **Call 122 to alert the fire department**
- In the event of fire, toxic fumes can develop. Leave the area immediately and inform people in surrounding areas.
- In outdoor areas, remain at a distance from developing fumes and gases, and observe the wind direction.
- If it is safe to do so, remove batteries from the area of the fire.
- **Only extinguish fire with foam or CO<sub>2</sub> extinguishers. A fire blanket is only suitable to a limited extent.**

## • Conduct in the event of accidents / First Aid



- Turn off the charger and disconnect the plug, taking care to protect yourself.
- In the event of an eye-injury caused by electrolyte, immediately rinse out the affected eye (for at least 15 minutes) and seek immediate medical attention
- In the case of skin contact, wash the affected area with plenty of water and soap
- **Call Emergency Services on 144**
- Rescue and attend to injured persons
- Administer first aid, consult emergency responders

## Maintenance

- Do not perform repair or maintenance work on Li-Po-ion batteries  
Li-Po batteries must not be disposed of with the general rubbish. Ensure that batteries are disposed of properly.
- **Tape over the electrodes prior to disposal.**
- Store defective Li-Po batteries in fire-resistant containers.

## Hazards for people and the environment



- Risk of injury from moving rotor blades
- Uncontrolled flight due to control system failure
- Exposed moving parts – danger of hair being drawn in
- Danger from lithium polymer batteries

## Protective measures and code of conduct



- Safety net – check flawless condition of net before operation
- It is prohibited to remain in the restricted area during operation!
- Operation = start-up and flight
- Operating instructions and safety regulations must be observed
- Use headgear or hair net in the case of long hair
- Observe operating instructions No. 39 “Lithium Polymer Batteries”

## Conduct in the event of malfunctions and in hazardous situations

- In the event of a control system failure, press the *Emergency Button*;  
if it is safe to do so, disconnect the power supply
- Emergency stop - flight controller off - engine off
- If it is determined that devices, installations or auxiliary devices are not in proper working order in terms of safety, the defect must be reported immediately to the responsible employee. The equipment or installations shall not be used and must be withdrawn from use by other persons and the danger must be pointed out.

## First aid – Emergency call 144



First-aiders: refer to list of first-aiders

## Maintenance

- Model flying objects may only be repaired by qualified specialists

# Operating Instructions

Model construction drone laboratory

BA 53

Room: B02.1.054

## Hazards for Persons and the Environment



- Risk of clothes or hair being caught and drawn in by an open drive, drill spindle, drill bit, or wildly spinning work piece.
- Danger of being struck by wildly spinning work piece, unsecured moving parts, or flying debris.
- Danger of cuts caused by shavings, moving saw blade, milling machine, sharp-edged work pieces.
- Caution! Wood dust is hazardous to health and may cause cancer.
- The use of Revell enamel colour can lead to skin damage and allergies; swallowing is hazardous to health; potentially **fatal** if swallowed or if it enters the respiratory tract; causes severe damage to the eyes

## Safety Precautions and Rules of Conduct



- Make sure that all devices can be shut down using the emergency stop button.
- Clamp the work piece tightly or fix it at the limit stop.
- Only change the drill or the work piece when the system is at a standstill.
- Take care when removing shavings (drills and milling machines).
- Use eye protection (safety glasses) during drilling, grinding and milling work.
- Cover long hair (longer than spindle circumference) with a hairnet or cap.
- Wear close-fitting clothes (wear sleeves with cuffs, or roll up sleeves on the inside); sweaters and work coats are not suitable.
- Ties, scarves, wristwatches, hand and arm jewellery are not permitted.
- Gloves must not be worn when operating machines where there is a risk of catching.
- In the case of large quantities of wood dust (hazardous to health!) vacuum at source or use a dust mask.
- Use ear protection when operating noisy machines.

## Conduct in the Case of Malfunction and in Hazardous Situations

- Press the **Emergency Stop Button** in the case of malfunction or danger.
- If it is determined that equipment, facilities or auxiliary means are not in perfect condition in terms of safety, this defect must be reported to the responsible employee immediately. The equipment or facilities must no longer be used and must be secured against use by other persons; hazards must be clearly marked and pointed out.
- If the drill breaks or becomes jammed, or if parts move around in an uncontrolled manner, switch off the machine immediately and rectify the fault while the machine is at a standstill.
- In the event of fire: extinguish with CO<sub>2</sub> extinguishers as far as this is possible safely; observe measures of self-protection!

## First Aid – Emergency Number 144



- Stay calm
- Observe measures of self-protection; rescue injured person(s)
- Reassure injured person(s); call in emergency responders
- Secure the scene of the accident; inform the line manager.
- For a list of qualified emergency responders see the instruction sheet „Conduct in the case of first aid“

## Maintenance

- Follow the manufacturer's instructions regarding maintenance and care!
- Repairs on the objects must only be carried out by qualified experts.

## Hazards for humans and the environment



- Risk of burns caused by touching the nozzle and extruder
- Risk of burns caused by touching the heating plate
- When opening covers or removing parts live components may be exposed
- Hazards due to electric shock!
- Hazards due to moving parts
- Hazards caused by hair becoming caught
- Possible hazards due to ultrafine particles
- SLA printers: Risk of skin and eye injury from contact with photopolymer

## Protective measures and code of conduct



- If possible, install frequently used devices in separate, well-ventilated rooms (air volume at least 20 m<sup>3</sup>)
- The accident prevention regulations and the manufacturer's operating instructions must be observed!
- When using devices that operate with mains voltage, disconnect the mains plug before opening covers
- Check activated carbon filter regularly, replace if necessary
- If no such filter is available, check for upgrade
- When working with photopolymer, wear nitrile or neoprene gloves and safety glasses, and wash your hands afterwards
- Should photopolymer come into contact with skin, wash immediately with warm water and soap

## Conduct in the event of malfunctions and in dangerous situations

- Damage to electrical wiring and components must be repaired by qualified specialists!

## First aid



- Observe the principle of self-protection; rescue injured person(s)
- Reassure the injured person(s); summon first aiders
- Secure the site of the accident; inform the line manager
- **Stay calm**  
**Emergency telephone number: 144**  
Trained first aiders according to **Conduct in first aid situations**

## Maintenance and working with resin

- Check the function and the safety devices of the machine before each use!
- Follow the manufacturer's instructions regarding maintenance and care!
- Maintenance work and inspections may only be carried out by persons authorized to do so
- Maintenance work may only be carried out when the unit is at a standstill
- Secure the system against unauthorized reactivation
- Disconnect the system from the mains
- Resins must be stored in a dark and well-ventilated place inside a black container with a lid (between +20 and +30°C)
- Observe the shelf life of the product
- Do not mix used and unused resin
- Resin should be fully cured prior to disposal