

# Working instructions

These instructions must be read and understood before starting the laboratory exercises.

## General instructions

- You can not do the measurements alone. There has to be at least two persons present when measuring.
- The devices have to be dead or de-energised when you do couplings. The employee is responsible of damages, if he has not switched the voltage off.
- Switching of the voltage has to be informed clearly, e.g.: “Watch out, I switch the voltage on.”
- Everybody has to know where the Emergency Stop -button is located. It is typed HÄTÄ SEIS in Finnish. This button will switch off the voltages of all devices.
- Wall sockets can be used to supply devices only with plugs. They also have to be protected according to the standards.

## Operations in case of accident

- Switch voltage off as soon as possible with the red Emergency Stop button.
- Check the status of the injured person. Check if breathing works, if he/she is in shock. Does he/she have large wounds, haemorrhaging or burn injuries.
- Call to the emergency number **112** and ask for help. Address of the laboratory is Otakaari 5 A, Aalto Yliopisto, Electrical department. Give first aid to the injured person. Call to the janitor (vahtimestari) so that he/she can advise the ambulance to the correct place. To be sure, someone has to go to the main door to lead the way. Laboratory Manager has to be informed later.

Emergency number 112

Janitor 050 911 5329

Laboratory Manager 050 346 9571

## Common electrical accidents

Electric current creates many effects in the human body depending on the intensity, route, and time of the influence.

- mild electrical tetanization (muscle cramp)

- mild nervous disturbances
- arterial hypertension (high blood pressure)
- electrical tetanization (muscle cramp), sticking
- ventricular fibrillation (cardiac vibration), low blood pressure
- black out, lose consciousness
- compression of the heart
- mild burn injury
- serious burn injury, poisoning of cells
- thermal injuries and eye injuries caused by electric arc

In case of electrical accidents, it is typical that the victim suffers also from injuries that are not caused by electricity itself but for example by falling.

### **Dangerous voltages and currents**

Less than 10 mA current is detrimental to health in very few cases. The most dangerous is alternative current of frequency 40...50 Hz. Alternative current 70...110 mA or direct current 200...250 mA is dangerous and killing, if current flows through breast (heart).

Impedance from hand to hand or hand to leg in a human body can be about 600...6000 W. It depends of humidity of skin and of intensity of current.