T.R. Karadeniz Technical University

Faculty of Engineering

Department of Electrical and Electronics Engineering

Occupational Health and Safety Guide for Graduate Research Laboratories

Laboratory supervisors and students must be able to contact the following units without delay in emergencies.

Unit / Position	Phone / Extension	Duty and Responsibility
General Emergency	**112**	**112 Emergency Call Center**
KTU Campus Security (24/7)	**0(462) 377 44 44**	**24/7 Campus Security and Response.**
KTU Medico-Social Center	+90 (462) 325 31 66	On-campus Health and First Aid.
Faculty Secretariat	+90 (462) 377 27 04	Administrative Notification and Damage Assessment.
Department Secretariat	+90 (462) 377 29 05	Departmental Coordination and Laboratory Supervisors.
KTU Duty Officer	0(462) 377 24 00	Emergencies Outside Working Hours.

1. INTRODUCTION

In the graduate research laboratories of the Department of Electrical and Electronics Engineering, research and development activities are carried out on robotic systems, embedded control platforms, sensor technologies, communication and telecommunication systems, image processing applications, biomedical electronic systems, power electronic converters, electrical machines, smart grids, microgrids, battery and energy storage systems, and DSP-based real-time control platforms.

During the work carried out in these laboratories, mobile robotic systems, experimental setups involving high current and high voltage, RF communication equipment, laser-based optical systems, sensitive electronic circuits, power semiconductors, battery systems, and various measurement devices are used.

This situation brings various occupational health and safety hazards, such as electric shock, short circuit, arc formation, electromagnetic exposure, fire, high temperature, mechanical injuries, chemical exposure, and battery-related risks.

This guide has been prepared to ensure safe working conditions for graduate students, researchers, faculty members, technical personnel, and authorized users. Laboratory users are required to comply with all rules stated herein.

2. PURPOSE AND SCOPE

The purpose of this guide is to ensure that research, development, experimental verification, and prototype development activities conducted in the graduate research laboratories of the Department of Electrical and Electronics Engineering are carried out safely.

The scope of this guide includes:

- Robotic systems
- Communication and telecommunication systems
- Image processing systems
- Biomedical electronic applications
- Sensor and measurement systems
- Embedded systems
- Power electronic converters
- Electrical machines
- Smart grids and microgrids
- Battery and energy storage systems
- DSP- and FPGA-based real-time systems

This guide covers:

- Graduate students
- Researchers
- Faculty members
- Technical personnel
- Project scholarship holders
- Visiting researchers
- Authorized laboratory users

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3. LABORATORY USE AND AUTHORIZATION RULES

1. Laboratories may be used only by authorized users.
2. Permission must be obtained from the relevant faculty member or laboratory supervisor to enter the laboratory.
3. Laboratory users must have completed the required equipment training.
4. Untrained users may not operate equipment alone.
5. Working alone in laboratories is prohibited.
6. Approval from the laboratory supervisor is required for work to be carried out outside working hours.
7. Unauthorized persons must not be allowed into laboratories.
8. Laboratory access cards and passwords must not be shared.
9. Faulty equipment must not be used and must be reported to the laboratory supervisor.
10. Necessary risk assessments must be conducted before all experiments.

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4. GENERAL LABORATORY SAFETY RULES

1. Distracting behavior must be avoided in laboratories.
2. Running and joking around in the laboratory environment are prohibited.
3. Food and beverages must not be consumed in laboratories.
4. Work areas must be kept clean and orderly.
5. Long hair must be tied back and dangling accessories must not be worn.
6. Closed-toe shoes with insulating soles must be worn.

7. Emergency exits and fire extinguishers must be identified in advance.
8. Unauthorized photography and video recording are prohibited.
9. Equipment must be de-energized at the end of work.
10. A general safety check must be performed before leaving the laboratory.

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5. ELECTRICAL SAFETY RULES

1. All connections must be checked before energizing the system.
2. Conductors whose energized status is unknown must not be touched.
3. Users must not work alone during high-voltage and high-current experiments.
4. Damaged cables and connection elements must not be used.
5. The system must not be operated before grounding connections are checked.
6. In systems containing capacitors, the discharge time must be observed.
7. In power electronic systems, attention must be paid to DC bus voltages.
8. Connections must not be changed while the system is energized.
9. Residual current devices and fuses must not be disabled.
10. If abnormal sound, smell, or smoke is detected, the system must be de-energized.

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6. OSCILLOSCOPE AND MEASUREMENT DEVICE SAFETY

Oscilloscopes and measurement devices are among the most critical pieces of equipment in laboratory work. Measurement errors may pose serious risks to both user safety and equipment integrity.

1. The ground connections of oscilloscope inputs must be checked.
2. Differential probes must be used in circuits with different ground potentials.
3. Maximum input voltage limits must not be exceeded.
4. Measurements must be started from a high Volt/div setting.
5. The 1X / 10X settings of probes must be checked before measurement.
6. An isolation transformer must be used for high-voltage measurements.

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7. SOLDERING AND PROTOTYPING ACTIVITIES

Soldering stations used during the physical implementation of electronic circuits are a focal point for thermal and chemical risks.

1. Soldering irons must be used only on their own stands.
2. Soldering iron tips must not be touched with bare hands.
3. Protective goggles must be worn during soldering.
4. Solder fumes must not be inhaled directly.
5. Soldering operations must be performed under suitable ventilation.
6. Hands must be washed after soldering.

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8. HIGH-VOLTAGE AND POWER SYSTEM SAFETY

1. Safety barriers must be used in high-voltage experiments.
2. Moving machine parts must not be approached.
3. All systems must have protective grounding.
4. Residual current devices and suitable fuses must be used.
5. Systems with blown fuses must not be re-energized until the fault has been eliminated.
6. Emergency stop buttons in high-power systems must be kept active.

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9. SPECIAL PERMISSION FOR HIGH-RISK WORK

The following activities may be carried out only with the approval of the laboratory supervisor:

- Systems above 50 V AC
- Systems above 120 V DC
- High-current experiments
- Lithium-based battery systems

- RF power amplifiers
- Laser systems
- Rotating electrical machines
- Grid-connected experiments
- Experimental work outside working hours

During these activities, at least two authorized users must be present in the laboratory.

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10. DATA SECURITY AND CYBERSECURITY

1. Unauthorized software must not be installed on laboratory computers.
2. The use of unlicensed software is prohibited.
3. Unauthorized devices must not be connected to the network system.
4. Experimental data must be backed up regularly.
5. User passwords must not be shared.
6. FPGA, DSP, and embedded system software must not be shared without authorization.
7. Portable storage devices must be scanned with antivirus software.

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11. FIRE AND EMERGENCY PROCEDURES

In case of fire, all energy sources in the laboratory must first be shut down safely, and people nearby must be warned loudly. Then, the 112 Emergency Call Center must be called, and the KTU 24/7 Security Hotline (0 462 377 44 44) must be informed at the same time. For incidents occurring outside working hours, the KTU Duty Officer (0 462 377 24 00) must also be informed. In fires of electrical origin, water must never be used; only CO_2 or dry chemical powder fire extinguishers should be preferred. If the fire tends to spread, the laboratory must be evacuated immediately, emergency exit routes must be followed without using elevators, and the designated assembly area must be reached. During a fire, in smoke-filled environments, people should move by keeping low, and the mouth and nose should be covered with a damp cloth if possible. The incident must also be reported to the laboratory supervisor and department administration as soon as possible.

11.1 In Case of Fire

1. Power sources must be shut down immediately.
2. People nearby must be warned.
3. Water must not be used in electrical fires.
4. CO_2 or dry chemical powder fire extinguishers must be used.
5. The building must be evacuated by following emergency exit routes.

11.2 In Case of Electric Shock

1. The injured person must not be touched directly.
2. The power must first be cut off.
3. 112 Emergency Service must be called.
4. First aid must be administered by trained personnel.

11.3 In Case of Injury

1. The first aid officer must be called.
2. The injured person must not be moved.
3. If necessary, the injured person must be referred to a healthcare institution.
4. The incident must be reported to the laboratory supervisor.

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12. PERSONAL PROTECTIVE EQUIPMENT (PPE)

Equipment	Area of Use
Protective Goggles	Soldering, optical tests, mechanical operations
Laser Safety Goggles	Laser experiments
Insulating Gloves	High-voltage work
Face Shield	Systems with arc risk
Flame-Retardant Clothing	High-current experiments

Equipment	Area of Use
Closed-Toe Shoes	All laboratory areas
Laboratory Coat	Chemical and soldering operations
Hearing Protection	Noisy power and motor tests
Dust / Gas Mask	Environments containing chemicals and particulates

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13. CONTINUOUS IMPROVEMENT AND SAFETY CULTURE

Laboratory safety practices of the Department of Electrical and Electronics Engineering are regularly updated in line with the principle of continuous improvement.

Laboratory users are expected to:

- Follow current safety procedures,
- Participate in occupational health and safety training,
- Report unsafe conditions,
- Adopt a safety culture

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14. USER COMMITMENT FORM

I hereby acknowledge and undertake that I have read and understood the occupational health and safety rules stated in this guide and that I will comply with these rules throughout my laboratory work.

User Information

Full Name

Title

Laboratory

Date

Signature

Supervisor / Responsible Faculty Member

Full Name

Date

Signature