

Department of Electrical Engineering & Computer Science

## **ELECTRICAL SAFETY**

for Staff and Students in EECS Instructional Laboratories

### **NEVER WORK ALONE**

If you will be working with energized circuits or equipment **over 50 volts peak or 50 volts DC**, make sure that at least one other person can see you and hear you. In case of emergency **DIAL 100** from any institute phone [**617-253-1212** from cell phones]; and notify the stock clerk or lab instructor on duty.

### **VOLTAGE RULES**

All EECS Instructional Laboratories lab kit voltages are **below 50 volts peak or 50 volts DC**. (OSHA permits “unqualified persons” to work on such circuits with “awareness-type” training, which is what this document is.)

If you intend to work on a project using power sources **over 50 volts peak or 50 volts DC**, you must first **secure permission** from your Instructor or TA; and take an **Electrical Safety Training class** from either Ron Roscoe [38-641, 253-4635] or Gim Hom [38-644, 324-3373] **before** any work on the project begins.

### **PREVENT ACCIDENTS: FOLLOW THIS ADVICE**

- Never hurry. Work deliberately and carefully.
- Connect to the power source **LAST**.
- If you are working with a lab kit that has internal power supplies, **turn the main power switch OFF** before you begin work on the circuits. Wait a few seconds for power supply capacitors to discharge. These steps will also help prevent damage to circuits.
- If you are working with a circuit that will be connected to an external power supply, **turn the power switch of the external supply OFF** before you begin work on the circuit.
- Check circuit power supply voltages for proper value and for type (DC, AC, frequency) before energizing the circuit.
- Do not run wires over moving or rotating equipment, or on the floor, or string them across walkways from bench-to-bench.
- Remove conductive watchbands or chains, finger rings, wristwatches, etc., and do not use metallic pencils, metal or metal edge rulers, etc. when working with exposed circuits.
- When breaking any high-voltage or high current inductive circuit open the switch with your left hand and turn your face away to avoid danger from any arc which may occur across the switch terminals.
- When using large electrolytic capacitors be sure to wait long enough (approximately five time constants) for the capacitors to discharge before working on the circuit.
- All conducting surfaces intended to be at ground potential should be connected together.

## ADDITIONAL CAUTIONS

- The EECS Instructional Laboratories (38-500, 38-600, 38-601) are equipped with Ground Fault Current Interrupt (GFCI) circuit breakers. Check for leakage paths to ground when breakers trip repeatedly and the problem is not due to an overload.
- Any equipment used in the laboratories must be equipped with a standard three-prong AC plug or a two-pronged polarized plug.
- All exposed non-current-carrying metal parts of fixed and portable equipment that may accidentally become energized should be grounded.
- All electrical equipment or apparatus that may require frequent maintenance must be capable of being completely disconnected from the power source.
- Do not bring into the lab or use in the lab equipment that does not conform to these rules without specific permission from your instructor, TA, or Ron Roscoe or Gim Hom.

## LASER LABORATORY SAFETY

- Students who intend to use laser systems **must** read the Radiation Protection Office (RPO) Laser Safety Program Handbook **before** working with lasers. Copies of this handbook are available from the 38-501 Stockroom.
- Students must attend the RPO Safety Training Seminar if they will be using Class III or IV lasers.

## RIGHT-TO-KNOW LAW (OSHA HAZARD COMMUNICATION STANDARD)

- OSHA requires MIT to inform employees (and MIT requires students be informed the same as employees) about potential exposure to hazardous chemicals and about the Institute's Hazard Communication Program and the requirements of the Federal Right-to-Know Law. Your supervisor/instructor and department are responsible for providing you with safety information and/or training on:
  - MIT Policies and Procedures on Environmental Health & Safety
  - Material Safety Data Sheets
  - Labeling requirements for all hazardous materials
  - The location of the hazardous material inventory of your work area
  - Any operations in your work area that involve hazardous chemicals and the associated health and safety hazards
  - Safety precautions and procedures
  - Emergency procedures
  - The hazards of tasks done infrequently
- The OSHA Hazard Communication Standard and MIT's written Hazard Communication Program are on file in the MIT Safety Office and will be made available to any member of the MIT Community, upon request.

## QUESTIONS ABOUT WORK/SCHOOL SAFETY

- Any questions about work or school safety should be brought to the attention of your immediate supervisor or instructor. If problems arise that cannot be solved at this level, you should contact the EECS Safety Officer:

Ron Roscoe

Rm. 38-641

253-4635

rroscoe @ MIT.EDU

## BASIC ELECTRICAL SAFETY PRACTICES

The Institute requires everyone who uses electrical equipment to understand these safety precautions to comply with the OSHA Electrical Safety-Related Work Practices standard and MIT's electrical safety policies. The following safe work practices can prevent electrical shock. Contact your supervisor for additional safety training if your job involves repairing, installing or working on energized parts.

### A. Safe Work Practices

1. Turn off and unplug equipment (instead of relying on interlocks that can fail) before removing the protective cover to clear a jam, replace a part, adjust or troubleshoot. Ask a qualified person to do the work if it involves opening equipment and creating an exposure to energized parts operating at **50 volts peak or 50 volts DC** or more.
2. Don't use an electrical outlet or switch if the protective cover is ajar, cracked or missing. Call FIXIT (x3-4948) and report this.
3. Only use DRY hands and tools and stand on a DRY surface when using electrical equipment, plugging in an electric cord, etc.
4. Never put conductive metal objects into energized equipment.
5. Always pick up and carry portable equipment by the handle and/or base. Carrying equipment by the cord damages the cord's insulation.
6. Unplug cords from electrical outlets by pulling on the plug instead of pulling on the cord.
7. Use extension cords temporarily. The cord should be appropriately rated for the job.
8. Use extension cords with 3-prong plugs to ensure that equipment is grounded.
9. Never remove the grounding post from a 3-prong plug so you can plug it into a 2-prong wall outlet or extension cord.
10. Re-route electrical cords or extension cords so they aren't run across the floor, under rugs or through doorways, etc. Stepping on, pinching or rolling over a cord will break down the insulation and will create shock and fire hazards.
11. Don't overload extension cords, multi-outlet strips and wall outlets.
12. Heed the warning signs, barricades and/or guards that are posted when equipment or wiring is being repaired or installed or if electrical components are exposed.

### B. Check for Unsafe Conditions (either before or while you're using equipment:)

1. Is the cord's insulation frayed, cracked or damaged, exposing the internal wiring?
2. Are the plug's prongs bent, broken or missing, especially the third prong?
3. Is the plug or outlet blackened by arcing?
4. Was liquid spilled on or around the equipment?
5. Are any protective parts (or covers) broken, cracked or missing?
6. Do you feel a slight shock when you use the equipment?
7. Does the equipment or the cord overheat when it is running?
8. Does the equipment spark when it is plugged in or when switches or controls are used?

### C. If you observe any of these unsafe conditions:

1. Don't use (or stop using) the equipment.
2. Tag/label the equipment UNSAFE--DO NOT USE and describe the problem.
3. Notify your supervisor, FIXIT or the service company, as appropriate.

Electrical safety is for everyone because even contact with the standard 117 volt electrical circuits, which we constantly use, can be lethal under certain conditions.

I CERTIFY THAT I HAVE READ AND UNDERSTOOD "ELECTRICAL SAFETY FOR STAFF AND STUDENTS IN EECS INSTRUCTIONAL LABORATORIES" AND "BASIC ELECTRICAL SAFETY PRACTICES" AND I AGREE TO ABIDE BY THOSE RULES AT ALL TIMES WHILE I AM ENROLLED IN ANY EECS LABORATORY COURSE, OR WHILE TEACHING OR ASSISTING IN A LABORATORY COURSE.

TA's & LA'S ASSIGNED TO ANY ONE OF THE LISTED SUBJECTS MUST, AS A CONDITION OF EMPLOYMENT, ATTEND ONE OF THE ELECTRICAL SAFETY TRAINING LECTURES HELD DURING THE FIRST WEEKS OF THE SEMESTER. EXACT TIMES AND PLACE WILL BE POSTED. ALL OTHER STUDENTS: FILL OUT, SIGN, AND RETURN THIS PAGE ONLY TO ONE OF THE EECS STOCKROOM WINDOWS at 38-501 or 38-601, IN ORDER TO RECEIVE YOUR LAB KIT.

[No laboratory kits or supplies or equipment will be issued to students until this form is filled out and signed and on file at one of the EECS stockroom windows at 38-501 or 38-601.]

SIGNED: \_\_\_\_\_

PRINT NAME: \_\_\_\_\_

MIT ID NUMBER: \_\_\_\_\_

DATE: \_\_\_\_\_

**EVERYONE PLEASE CHECK SUBJECT NUMBER:**

6.002 \_\_\_\_\_ 6.003 \_\_\_\_\_ 6.099 \_\_\_\_\_ 6.101 \_\_\_\_\_

6.102 \_\_\_\_\_ 6.111 \_\_\_\_\_ 6.115 \_\_\_\_\_ 6.121J \_\_\_\_\_

6.131 \_\_\_\_\_ 6.152J \_\_\_\_\_ 6.161 \_\_\_\_\_ 6.301 \_\_\_\_\_

6.302 \_\_\_\_\_ 6.331 \_\_\_\_\_ 6.691 \_\_\_\_\_ 6.776 \_\_\_\_\_

Other \_\_\_\_\_ (specify)