Engineering Student Projects Lab (ESPL)

Topics covered:
- ESPL Location & Mission
- Safety & Rules
- Risks & Expectations

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ESPL location
I-Card access to ESPL requires 2 steps:

1. DRS Training:  https://www.drs.illinois.edu
   Take: Laboratory Safety Training, Part 1 and 2
   Email the certificate pdfs to your team contact so they can be checked off on your team roster. Valid for 3 years

2. CBTF ESPL Safety Test:  http://www.drs.illinois.edu
   ESPL Safety Test (must get ≥ 94% correct = miss 2 to 3)
   Test covers everything in this presentation.

Purpose of ESPL

• To enable engineering RSO teams to be competitive in national and/or international engineering competitions.

• To pioneer a multi-disciplinary learning environment that enhances understanding of engineering theory with practice.

• To provide training for students in basic shop safety, machining welding, and team management skills.
RSO admittance to ESPL

- For a group to have access to ESPL it must be:
  1. An RSO (Register Student Organizations) in good standing
  2. Be competitive in a national or international competition related to engineering,
  3. Multi-disciplinary: the majority of team members should come from more than one department in the College of Engineering.
  4. Granted access to ESPL by the Engineering Design Council.

- Admittance to ESPL is a privilege NOT a right. It can be revoked.

Why are knowing safety rules important?

- You make the choices that affect your health and well-being
- Your co-workers and staff personnel rely on you to keep them safe.
- You need to be empowered to confront others if they are not acting safely. It is your responsibility to talk to someone who may be doing something unsafe. You both will get into trouble if you don’t.
Eight main safety rules:

1. *Clean* work area – and keep it that way.
2. *Safety glasses* to be worn in all work areas at all times.
3. *Hearing protection* used near loud equipment or activities.
4. *Respiratory* (inhalation) *protection* used for chemicals and fine debris.
5. *Appropriate dress* (closed toed shoes, no loose clothing, no jewelry, and no loose hair) in all work areas:
6. Use only *tools* and equipment you are *trained* on, in a safe manor.
7. Use the *buddy system* when using *power tools or chemicals*.
8. *Hazardous chemicals* should be used only in appropriate locations and only stored inside the yellow chemical storage lockers.

Why being “Clean” is so important?

- The most common work injuries occur because of messy work areas.
- Teams must maintain a 32” wide aisle from the entrance to the back of every work room and in front of all fire-extinguishers and circuit boxes.
- No cardboard boxes on floors (put on shelves or under tables).
- Workbenches must have 1/3rd of the work surface clear.
114 computer room

- The computer lab is a **communal space**.
- **No fabrication work** of any kind (sanding, gluing, etc). No eating by the computers.
- No team items except in designated cabinets.
- **Items left on the conference table over-night will be disposed of**.
- Log off computers when you are done. If you are running a longer simulation, **leave a note**.
- Computers 7-9 are preloaded with photo and video editing software. Computer 9 contains software for the vinyl cutter and students wishing to use the cutter have priority here.

Safety glasses

- Worn at all times in any of the **work room** areas: 110, 117, 118, 119, 120, and 123.
- **NOT** 111, 112, 114, 115, or 116
Hearing protection

- Required when noise exposure exceeds 85 decibels. If you suspect an activity in excess of 85 dB, you can request a noise survey from Safety and Compliance.
- Use hearing protection anytime noise level is loud enough to prevent a *normal conversation* at a normal distance without shouting.

Sanding & cutting fiberglass and carbon fiber

- Sanding can release fiber and resin particles that get in your eyes or become lodged in your lungs or skin pores and will not come out.
- Health concerns:
  - Lung *inflammation* and *difficulty breathing*
  - *Rash* and itchy or irritated skin
  - Sever eye irritation and *corneal abrasion* when you rub your eyes
Sanding & cutting rules for composites

• Check Material Safety Data Sheet (MSDS). Will any toxic materials be produced? Only paint, epoxy, and/or bondo can be sanded at ESPL without further training (see ESPL director).

• For sanding, use either the sink in room 119 with running water or the paint booth with the exhaust on.

• Required PPE (Personal Protective Equipment)
  1. Respirator (aka mask with filtration)
  2. Goggles
  3. Nitrile gloves
  4. Long shirt tucked into gloves

• Composite work must be done with a “buddy”

Buddy system for composite sanding/cutting

• Buddy should help verify PPE is used correctly (goggles, respirator, gloves, appropriate dress, etc.)

• Buddy can immediately collect any particles with a vacuum (*if dust isn’t collected, then someone else will be exposed*)

• One person works, the other should watch for health warnings:
  • Rapid breathing
  • Headache or dizziness
  • Confusion or visual misperception
  • Sense of euphoria or apparent drunkenness

• If you notice any health warnings, stop working on composite and move to area with fresh air!
Respirator usage & storage

- Respirators (w cartridges) and a sharpie pen are stored in zip-lock bags on the shelves above the drinking fountain.
- Each circle on a cartridges represent 1 hour of use
  - Darken circles for time used when finished
  - Use ¼ hour increments for filling in circles
- When done, wipe off the mask using an alcohol wipe and return the sealed zip-lock to the shelf.
- If all the circles are filled in, place the entire zip-lock bag in the “expired” container on the shelf.

Respirator requirements to use

- It takes work to breathe through filters – if you have any physical impediment (e.g. sickness or cough) you cannot use a respirator.
- You must be clean shaven to use a respirator (no beard or mustache)
- Know how to do a negative pressure “fit-check” as shown in the video (v=nFTtfA73Oa4)
- Only to be used for sanding epoxy, paint, or bondo. For other use with chemicals or if required by MSDS, see Director for certification & training.
Appropriate dress

- Closed toed shoes in work areas where you need safety glasses.
- No jewelry, loose clothing, or loose hair is permitted in work areas.
- If you are giving a tour, then jewelry and clothing restrictions can be waived, but no work should be done while tour is nearby.
- Long pants are recommended but not required.

Power tool safety

1. **Dull** power tools become very **dangerous** power tools
2. Use the **right tool** for the job – “novel” uses for tools are often the causes of injuries.
3. **Secure work-part** – major cause of injuries with power tools is something coming free.
4. Make sure you use the correct **PPE** (personal protection equipment)
   - safety-glasses, face-shield, ear-plugs, respirator, etc.
5. Keep others at a **safe distance**
Power tool best practices:

- Always push power tools *away from you* – don’t pull it toward yourself
- Always keep a tool *safety guard* between you and the cutting edge
- *Never force* a tool – turn it off if it becomes jammed.
- *Think* about possible Hazards when using the tool:
  - Eyes contaminated with debris, skin contact with a cutting surface, puncture wound potential, entanglement hazards, heavy object collision, etc.
- *Secure work* with vice or clamps freeing both hands for safer tool use.

Glove usage

- Sometimes a good idea, sometimes bad
  - Use rubber gloves when using any chemical that has an MSDS that requires their use (i.e. anything stored in the yellow flammables cabinets). Especially for mixing epoxy resin.
  - Use leather gloves when welding or grinding.
  - Because rotary tools can catch a glove and pull the hand into the tool, don’t wear gloves with rotary tools – they are not allowed in the machine shop.
Tool storage

- Do not use tools with which you do not feel *comfortable*.
- Do not *borrow* tools without *asking*.
- All tools should be *labeled* as to which team they belong:
  - Orange – FSAE
  - Blue – IFE
  - Green – Baja
  - Yellow – Supermileage
  - Red – i-Robotics
  - White – Solar Car
  - Silver – Rube Goldberg
  - Pink – ESPL general use
- Unlabeled tools that are left out will be collected, and after 1 week be colored pink.

Grinder safety

- Keep *hands free* from grinder surface.
- Keep part surface *normal* to grinder surface so part doesn’t get pulled between the grinder guard.
- Keep part against work rest.

Contact the director of ESPL if either the grinder guard or work rest are not positioned correctly.
Buddy system

• You need to have another person with ESPL access working with you, not involved in another activity, when doing any potential dangerous activity, such as:
  • Any power tool – electric or air-powered, in the machine shop or work rooms
  • Any chemicals – epoxying, dispensing gasoline, spray painting, etc.
  • Use of a respirator – sanding epoxy, paint, and/or bondo, or composite cutting
• In the event of an accident the other person needs to be able to:
  • Phone 911 for assistance
  • Assist you to a safe area, the safety shower, and/or provide you with initial first aid
  • Be trained with the tool you are using to shut it down safely
• “Vicinity” – defined as hearing distance and in line of sight of the person using the power tool, chemicals, or respirator. Assume within ~10 feet.

Chemical labeling & storage:

• All chemicals need a NFPA diamond label, and if any number is higher than “1” it must be stored in the yellow cabinets in 110.
• Examples:
  • Gasoline, acetone, & ethanol: 1 – 3 – 0
  • Latex paint: 1 – 0 – 0
  • Motor oil: 0 – 1 – 0
  • Epoxy hardener & fiberglass resin: 3 – 1 – 1
  • Engine cleaner: 2 – 2 – 0
  • Brake fluid: 1 – 2 – 0
• Before a chemical is brought inside ESPL, you must have permission from the team captain and ESPL Director, and it must be clearly labeled.
• Used oil is disposed of in the barrel in room 119
Chemical spills & hazards

• In the event of a spill, notify nearby students, get the chemical spill kit (in hallway near bathrooms), and cover the spill with the absorbent material. When absorbed, sweep it up and dispose.

• If spill become life threatening (e.g. large, dangerous, etc.) then evacuate the building, call 911, and then call the ESPL Director.

• *Paint ONLY inside paint booth* in room 110 or outside.

• *Epoxy curing and mixing* is done only in well ventilated areas (i.e room 119 or 110). If the MSDS requires fumes to go outside, then cure either *inside the paint booth*, or if vacuum infusing, with the vacuum exhaust tube going outside under the garage door.

• No welding near a fuel source or trash can.

Electrical hazards

• Never carry a tool by its cord – cords can pull out of their connectors.

• Tools with exposed wires or frayed connections should never be used.

• Do not use electric tools in wet or damp environment, or near explosive chemicals or fire hazards.

• Never daisy-chain electrical cords
Engine testing

1. Running an IC engine means the *garage door* needs to be *open* and the engine located as close as possible to the open door (preferably right outside the garage door). Alternatively a sealed hose can be attached to the exhaust and extended outside.

2. Must have working *fire extinguisher present* (within 20 feet).

3. Must have at least 2 *people* present (do not start an engine by yourself).

4. Never leave a running engine *unattended*.

Fire extinguishers
First aid / absorbent cleaner

Eye wash stations
Parking lot lighting

The parking lot is a **high crime area** – be aware of your surroundings and keep the garage door **locked**.

Lights have been installed outside the garage door; switch located at blue arrow Use at night but DO NOT LEAVE ON.

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Storm refuge

- In case of a tornado or damaging storm, please move to an interior room such as one of the bathrooms or room 120.
Evacuation area(s)

- If the fire alarm sounds, move quickly and carefully to the evacuation assembly area – located on the grassy area next to MRL (just to the West).

- If the weather is bad, or the vicinity unsafe, then move to the secondary assembly area: on the front porch of MRL further to the west.

Threat action

- If you observe an individual carrying a weapon and/or acting in a hostile, belligerent manner you should:
  - Evacuate the area and call 911
  - If you can’t leave safely, then secure yourself wherever you can.

- If Illini-Alert system notifies you of an active threat in your vicinity:
  - Do NOT leave the building.
  - Close and lock all doors. Stay AWAY from entrance doors.
  - Best to relocate to team rooms or the computer room – door closed.
  - Feel free to barricade the door and prepare yourself as you wish.
  - Do NOT leave until you receive an “all-clear” alert on the illini-alert system (you can sign up at [http://emergency.illinois.edu/](http://emergency.illinois.edu/))
Your responsibilities

The causes of most accidents:

• I didn’t see          - Make sure the work environment is safe
• I didn’t know         - Make sure you get the training you need
• I didn’t think        - Don’t rush things and get enough sleep

What to do if …?

Spill:

• Water
  • Use mop to clean spill – don’t leave it to evaporate
• Oil / Petroleum Fluid / Fuel
  • Pour absorbent from chemical spill cart on it and let it absorb for a few minutes
  • Sweep and discard used powder in trash.
• Chemical from chemical cabinet
  • Use absorbent material to contain and follow MSDS instructions,
  • Contact lab Director and dispose of according to DRS procedures.
What to do if …?

**Accident or Fire**

- If someone is injured, *get others to assist* with medical help, calling 911, etc.
- Use fire extinguishers to contain small fires - evacuate building if needed
- When you call 911 tell them briefly:
  - *What happened:* the nature and severity of the injury, fire, or chemical spill
  - *Your location:* 1203 West Western in Urbana or just south of the Advanced Computation Building at 1011 West Springfield in Urbana
- Any injury requiring more than a band aid MUST be reported to the ESPL Director (don’t wait until the next day – call 217-778-7799)

What to do if … ?

**Tool / Machine Breaks**

- Email ESPL Director: [mems@Illinois.edu](mailto:mems@Illinois.edu). Describe what is wrong. If you believe you can fix it yourself, talk with the Director before attempting.
- Place a “Tool is Down” note on the tool, and your name and email, so someone can contact you if they have questions.
- Do not try to operate a machine if a “Tool is Down” note is attached.
- Your team could be charged to replace or fix a broken tool if negligence was determined to be the cause (but not for tool normal “wear and tear.”)
Handling of Infractions

• First Offense
  • Verbal warning and team Leaders will be notified

• Second Offense
  • Access to ESPL removed until an acceptable essay is written to the team leaders and ESPL Director explaining why the safety infraction happened, why the rule is important, and why it won't happen again.

• Third Offense
  • Access to ESPL will be removed until the Engineering Design Council can review each of the three safety infractions and talk with the student directly.

Expectations of Students

Clean work area:
• Don’t leave tools out or supplies on floor – keep walkways clean & clear
• Keep clear a 32” aisle from workroom door to back of room at all times

Friendly and respectful attitude:
• Be considerate of others wanting to use machines
• Learn people’s names from other groups – be willing to help out.

Safety conscious: don’t do anything FOOLISH
• If you see someone doing something they shouldn’t – TALK WITH THEM.
• Do not work when tired, take a break if you need it – get enough sleep.
Register to Take Tests at CBTF

- Go to the CBTF website: https://cbtf.engr.illinois.edu/
- Select “Add a course” and then select “ESPL 100: Engineering Student Projects Laboratory” – select a time to take the test.
- Location is basement of Grainger Library – room 57 (east side)
- Bring iCard, no notes, no cellphone
- Use the restroom before you get there

Remember…

Do it Right The First Time! Plan Ahead
Acknowledgement of training:

“I understand that the use of power tools, lathes, mills, bandsaws, welding equipment, grinders, and other shop tools are potentially hazardous activities, and I understand that by being at ESPL these activities may be going on around me. I understand that I should NOT use any shop tools unless I have been sufficiently trained and am medically able to safely handle and use such tools. I agree that I take responsibility to ensure that the training I have received has sufficiently prepared me with the knowledge to use the equipment appropriately, and if not, I will seek help and clarification before using such tools. I understand that serious injury and even loss of life can result when power tools are used improperly.”

Acknowledgement of safety responsibilities:

“I agree to wear all appropriate personal protective equipment and to follow all policies, procedures, and safety processes outlined in all of the ESPL shop training programs. I agree that my safety also depends upon me ensuring that others around me are following all policies and procedures. I agree to take responsibility for not only ensuring my own safe work environment but to help ensure the work environment around me is also safe.”
Acknowledgement of inherent risks:

“I understand and acknowledge that my participation in activities at ESPL involves inherent risks such as, but are not limited to: risk of property damage, bodily injury, and possibly death. I understand and assume the risks that arise out of my use of the equipment or facilities at ESPL, the activities that occur in and around ESPL, the acts of others, or the unavailability of emergency care. I understand the risks I am voluntarily subjecting myself to.”

Acknowledgement of consent:

“I hereby consent to any publicity, including the use of my name and likeness, in connection with ESPL or participation in any activity that utilized or was aided by the ESPL facility. I consent to the collection by ESPL of personal information including: my name, phone number, major, year in college, and sex, and the publication of team demographics that may include team member’s major, year in college, and sex.”
Final message:

ESPL is the place where engineering comes alive