Johns Hopkins University
Department of Biomedical Engineering

Machine Shop/Design Studio
Safety
Outline for today’s lecture

• Facilities (Locations, Hazards, and Equipment)
• JHU Priority of Safety
• Personal Protective Equipment
• Review the BME Machine Shop/Design Studio Safety Rules
• View pictures of equipment and video clips
• Discussion about safe operating procedures
• How to gain access (Process and Documentation)
The Mission of HSE

• Compliance with Federal and State Regulations
• Effective Environmental and Occupation Management practices
• General protection of the students and workers in the Johns Hopkins System.
Facilities

- **Design Studio West**
  - Located on the 2\textsuperscript{nd} floor of Clark Hall Room 217.
  - **Equipment in this area includes:**
    - Makerbot and Ultimaker 3D printers
    - Makerbot and NextEngine 3D scanners
    - Sewing Machines
    - Soldering Station
    - Hand Tools
  - **Hazards in this area include:**
    - Hot Surfaces (Soldering and Printer Extruder, heat guns)
    - Class 1m laser (Scanner)
    - Inhalants (Soldering Station)
    - General Shop hazards (i.e., powertools, handtools, sharps)
• **Design Studio East**
  - Located on the 2\textsuperscript{nd} floor of Clark Hall Room 218.
  - **Equipment in this area includes:**
    • Dimension 3D Printer
    • Objet Material Jetting Printer and power washer
    • Fume Hood
    • Laser Cutter
    • Acrylic Irons
  - **Hazards in this area include:**
    • Hot Surfaces (Printer Extruder, Acrylic irons)
    • Class 4 CO2 laser (Fire)
    • Inhalants (Fume Hood/Laser Cutter)
    • General hazards (sharps)
• **BME Machine Shop**
  – Clark 214
  – Equipment in this area includes:
    • Band Saw
    • Drill Press
    • Sanders
    • Mill*
    • Lathe*
    • Hand Tools
    • Measuring equipment
    • Vise
    • Shear
    • CNC Router
  – Hazards
    • Sharp Items
    • Flying Debris
    • Electrical shock
    • Mechanical Injury
    • Pinch Points
    • Entanglement
    • Inhalants

* Additional Training Required
In depth understanding of Risks and Hazard

(Possibility + Severity) – Mitigation (Listed Below) = RISK

• Engineering Controls

• Administrative Controls

• Personal Protective Equipment
Personal Protective Equipment (PPE)

- Safety Glasses (Chemical or Machine Shop only)
- Face Shield
- Basic Dust Mask
- Ear plugs
- Hair Ties
- Gloves (Chemical or Welding)
- Disposable Apron

USE PROPER PPE FOR SITUATION
BME Shop Safety Rules

1. EYE PROTECTION, OR FACE SHIELDS ARE REQUIRED WHEN WORKING IN THE MACHINE SHOP. A selection of protective goggles and safety glasses are available in the shop.

2. All injuries must be reported to the Site Safety Officer immediately (Tom Benassi). Do not hesitate to report near misses, might prevent someone else from getting injured.

3. NO BARE FEET OR OPEN-TOED FOOTWEAR ALLOWED IN ANY OF THE DESIGN STUDIO SPACES WHEN IN THE MACHINE SHOP- Long hair must be tied back, long sleeves must be cuffed or rolled up, and loose jewelry secured when working on machinery.

4. NO FOOD OR DRINK ALLOWED IN DESIGN STUDIO EAST (CLARK 218, 216 (SBE), and THE MACHINE SHOP).

5. NO WORKING ALONE IN THE MACHINE SHOP.
6. ENSURE THE SAFETY OF YOURSELF AND OTHERS
Be aware of your surroundings. If you see someone committing an unsafe act, report it to the supervisor immediately.

7. IF YOU BREAK A PIECE OF TOOLING, discover broken tooling or machinery that is not operating correctly; notify Tom Benassi immediately. Everyone must comply with this rule in order to prevent injuries caused by broken or malfunctioning equipment. Hiding or concealing broken tooling only slows the replacement of that piece of tooling, so it won’t be there the next time you need it if you didn’t tell the supervisor that you broke it.

8. YOU MAY NOT WEAR GLOVES while operating machinery. (Machine shop only) Holding objects with a rag near moving machinery are also not permitted. Gloves, rags, etc. can be easily caught in machines that are in motion, pulling the operator into the equipment.

9. SECURELY CLAMP DOWN ALL WORK PIECES IN DRILL PRESS AND MILLING MACHINES. This will prevent work from being lifted up or spun around with the cutters. Use all guards that are available and be wary of points of contact with rotating cutters and chucks.
10. **USE A VACUUM CLEANER** when machining non-metallic substances. (e.g. macor, micarta, phenolics, etc.) This will help control air-borne dust.

11. **DO NOT MACHINE, GRIND, or CUT ANY RADIOACTIVE OR OTHER SOLID TOXICS** (Beryllium, asbestos) in the shop.

12. **DO NOT LEAVE KEYS ON CHUCKS OF LATHES, DRILL PRESSES, AND MILLING MACHINES.** The key can be thrown out with GREAT force when machinery is turned on. This also applies to wrenches used to tighten the cutting tools into the spindles of the milling machines.

13. **USE A BRUSH OR WOODEN DOWEL TO REMOVE CHIPS FROM THE MACHINING AREA.** Do not use your hands. Chips can be very sharp and often very hot.
15. CLEAN UP THE WORK AREA USING BRUSH AND DUSTPAN.

16. CLEAN AND REPLACE TOOLS WHERE YOU FOUND THEM. The toolboxes and cabinets are organized according to the character of their contents. People expect to find tools in their ‘usual’ locations, so clean and replace everything where it belongs when you’re finished.

17. DO NOT ATTEMPT ANY UNFAMILIAR OPERATIONS. When in doubt, seek advice and help from those more experienced in the operation.

18. FOLLOW GUIDELINES POSTED ON THE INDIVIDUAL PIECES OF EQUIPMENT.

19. In order to prevent injury to you and damage to the equipment, DO NOT ATTEMPT TO OVERLOAD THE CAPABILITIES OF THE MACHINERY.
Next Video Courtesy of Tom Hintz

- Play Video from separate location.

http://www.youtube.com/watch?v=miJazBQbyII
What not to do!!!

https://youtu.be/OEASEz4Ql04
Workshops

• October 28, 6-7pm and 7:30-8:30pm (3d Printing)
• November 4, 6-7pm and 7:30-8:30pm (Laser Cutting)
• November 11, 6-7pm and 7:30-8:30pm (Polymers)
• https://forms.gle/drj6fPFBuGimhC8X9
• Please refer to https://designstudio.bme.jhu.edu
Questions?