

# Policy 2001

## Machine Shop Policies and Regulations

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### **Purpose**

It is typical in many physics departments, particularly those with active research programs, to have a small machine shop for making simple instrumentation and performing repairs. At James Madison, we have had such a shop in some form for many years. With the construction of the new Physics and Chemistry Building in 2005, the physics department shop was upgraded to include much new equipment including two milling machines, two lathes, both vertical and horizontal band saws, and press brake/shear.

The purpose of the shop is threefold. First, it exists to support the daily activities of the department as a facility for the simple repair and construction of apparatus for the teaching needs of the department. Second, it is a research support facility to be used by both professors, and their students, in making and modifying scientific research equipment. Finally, it can be used as a teaching tool to improve the mechanical and manufacturing skills of undergraduate physics majors, particularly those involved in other experimental research in the department.

Machine shops are by nature hazardous environments. This could vary from the chemical hazards of solvents and paints used to finish or clean metal parts to the actual mechanical dangers of the equipment and large objects that can be encountered. Because of the variety of needs for the shop and the dangers inherent in shop work, there will be several classifications of users and their privileges in the shop. General safety rules will apply to all users and the fact that some classifications give a user more freedom to use the shop should not mean that they need not make any attempt to adhere to the stricter rules of a lesser classification unless absolutely necessary.

### **Definitions**

#### *Faculty:*

Those hired by the university into the Department of Physics.

#### *Student Users:*

This designation indicates students that are permitted use of the shop in accordance with their level of certified and documented training.

#### *Level I Certified:*

Level I certified students have the ability to use standard hand tools and can act as the "safety" person for higher level certified students. He or she knows where the emergency shutoff switch is located and how to contact help.

#### *Level II Certified:*

Level II certified students have been trained to use specific machines in the

shop.

*Level III Certified:*

Level III certified students have demonstrated a high level of capability on specific machines.

*Guest*

A designee of faculty, staff, or advanced student users.

**Applicability**

This policy applies to all faculty and students at all times.

**Policy**

A list of currently active student users and their faculty mentors will be posted on the wall of the shop and kept up-to-date. Students should not assume they are advanced users unless their name is clearly on that list.

The personnel categories defined above have the following privileges and responsibilities:

*Faculty:*

Faculty members may use the shop at any time, though it is highly recommended that they not do so when there is a likelihood that a serious accident could leave them incapacitated without anyone to care for them. There should be someone within earshot who can call for help.

It is the responsibility of faculty who have students that need to work in the insure that their students are properly trained on the equipment they need to use.

Faculty who train a student to use equipment will coordinate with the Lab Manager to ensure the student is added to the posted list and document the level of training.

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*Student Users:*

Student users are allowed to use the shop only under the conditions allowed to them per their level of training. After hours use of the machine shop is reserved for Level II student users, and must be arranged with the approval of the student's advisor and agreement with the lab manager.

Student users must not work alone and should be accompanied by a second person when working in the machine shop. This applies to all certification levels and work done any time of day. See details of Guest.

*Certification Training*

Faculty who train a student to use equipment will coordinate with the Lab Manager to ensure the student is added to the posted list and document the level of training.

*Level I Student User:*

Level I student users will have received training to identify safety components within the machine shop, and be aware of what to do in case of an emergency. Level I certification will also allow users to use basic hand tools to perform simple maintenance and repair work in the shop.

*Level II Student User:*

Level II students will have received training for specific machines within the shop in accordance to this policy. Training documentation for these students will be kept on file by the Lab Manager.

*Level III Student User:*

Level III students will have received training for specific machines and will have demonstrated a high level of capability with those machines. It is recommended to complete the machine shop course for Level III certification. Training documentation for these students will be kept on file by the Lab Manager.

*Guest:*

Guests are allowed in the shop primarily for security purposes such as when a faculty member or advanced student needs to complete work after hours. There should never be more than 2 guests in the shop at any time. They should never distract the actual user from their work. Likewise, they should be shown from the first instant they enter the shop where the emergency shut-off controls are, where the first aid kit is, and where the telephone is. The guest is never allowed to operate any machinery except in emergency shut-down situations.

## **Procedures**

*Hazards and Their Avoidance*

The primary types of injuries that might occur in a college level shop involve either the fingers and hands, the eyes, or the ears. While it is virtually impossible to avoid numerous small cuts, bruises, or other injuries to the hands, it is possible to avoid the type of serious incident that leads to stitches or, worse yet, the loss of all or part of a finger. The simplest thing is to avoid all contact with moving machine parts and to avoid sharp edges. The following are some rules for the shop to follow to avoid serious injuries and apply to all users and guests:

- Always wear safety glasses when in the machine shop.
- Never touch a cutting tool or rotating work piece while it is still in motion. This includes drills, end-mills, saws, and work pieces in the lathe.
- The moment before you turn a machine on, pause to make a mental check of where your hands are and any direction the cutter or parts of the machine may move. For instance, check to make sure that you don't rest your hand at some location that could be a pinch point. Stay very aware of where your hands are in relations to the machine parts.
- Try to only pick up cutting tools by the shank or while wrapped in a cloth or paper towel to avoid contact with the sharp cutting edge of the tool.
- Be aware that work pieces after machining can sometimes have

edges as sharp as or sharper than the tools themselves. Always try to pick up a work piece by its flattest, most stable faces and remove sharp edges as soon as possible after machining by filing or grinding.

- Make sure all work pieces are securely attached to the machine before starting and that intentionally loose pieces such as wrenches and chuck keys are removed.
- Do not wear large, loose fitting clothing that could be tangled in the machinery.
- No open-toed shoes are allowed in the shop.
- Remove all loose fitting rings, necklaces, bracelets, and wristwatches while working in the shop.
- Long hair should be tied up and secured
- If the job you are doing will involve lifting of heavy objects, only do so by bending your knees and getting help if needed.
- Do not lean, stand, or sit on machines or the countertop where work is ongoing.
- Do not touch the controls of a machine someone else is operating.
- Do not allow yourself to be distracted by other users or guests in the shop.
- The door to the hallway should remain open when anyone is in the shop working.
- The table saw is stored in the shop although not a machine shop tool. It is not to be used in the shop. It is to only be used on the loading dock by properly trained personnel.

#### *Emergency Responses*

All users and guests of the shop should be familiar with the location of the first aid kit, the phone, and the emergency shut off for each machine. If a significant injury or other incident occurs, the first response should be to contact **campus security (8-6911)** who will dispatch emergency medical personnel. Standard first aid procedures should be used such as keeping unconscious victims immobile and wrapping severe cuts with clean sterile cloths or wipes while applying pressure. For all incidents involving professional medical attention, a report must be filed with the department head and laboratory manager as soon as possible so that appropriate action may be taken to avoid a recurrence.

#### *Food & Drink, Clothing, Headphones*

Food and drink is never allowed in the machine shop.

Clothing should be appropriate to an oily environment with the aforementioned hazards. No open toed shoes are allowed by any user or guest. Short sleeve shirts are recommended, though long sleeve shirts are allowed so long as the cuffs are not baggy and loose fitting. Safety toe shoes are desirable if you will be working with large work pieces or other significantly heavy objects.

Because it is important to be aware of the operation of the equipment and others in the shop, music on speakers, or the use of headphones is

prohibited.

### *Cleaning and Maintenance*

The shop should always be left in a condition that is as good as, or better than you found it. This means in particular cleaning metal chips and other debris from the machines and floor. All tools and supplies must be returned to their proper location. If you must leave a job in process, you must leave a note close by telling who you are and when you intend to return. If you feel that any of the machines are not working properly, immediately report it to the department lab manager or the department head.

### *Access*

Access to the machine shop, for Level I and Level II certified students, is limited to normal working hours. Level III certified students may be granted afterhours access by explicit permission from the student's research advisor in coordination with the lab manger. When extended access is granted, Level III student users must follow the procedures described in the after-hour access policy.

After-hours access to the machine shop is limited to only the length of time necessary as determined by the student's faculty supervisor. This access is granted only for the purpose of completing a specific project.

Level I and Level II student users cannot obtain after-hours access to the machine shop. If hand tools from the shop are required after-hours then, with the laboratory manager's and faculty advisor's knowledge, they should be gathered during normal working hours, and taken to the faculty advisor's research lab for use there.

### **Responsibilities**

It is the responsibility of all shop users to follow the procedures outlined above at all times and monitor the actions of others also working in the shop. Failure to report unauthorized access or inappropriate usage of the facilities is grounds for imposition of sanctions.

### **Sanctions**

Violations of any of these policies will be handled at the judgment of the department head, department lab manager, or instructor of the shop course. This could include loss of user classification, temporary loss of privileges, or permanent expulsion from the shop. Any appeal of this judgment will have to go through the department head or through the student grievance procedure outlined in the student handbook. Suspension or expulsion of students enrolled in the shop class will mean at least a grade of *I* or *WF* in the course.

### **Exclusions**

None.