Northern Illinois University

EB Manufacturing Lab
Use, Assistance and Guidance

Hours M-F 8:00 – 4:30
Shop Use / Training and Other Resources
Why Training?

In the past safety and training has been handled in a more casual way relying on the instincts and judgement of individuals.

• Students wanting to use the Machine Shop will be required to complete orientation / training.

• We have been fortunate to not have had any major incidents. The number of students needing to use the equipment has made a more formal process necessary.

• Students who have been trained on the shop equipment are able to work on their own projects with guidance and supervision and when needed can request assistance.

• This will help us provide a safe environment for all members of CEET and comply with safety and training requirements.
Machine Shop Use and Training

- Anyone wanting to work in the shop is required to attend instruction sessions on the shop and individual equipment. Training is usually Thursday afternoon and Friday morning.

- Once you have been checked out on a piece of equipment you can reserve a time slot to use the shop with supervision and guidance, 8-4:30 M-F.

- Use our O365 Bookings app to request training, shop use and services.

https://outlook.office365.com/owa/calendar/CEETEBMachineshop@mail.niu.edu/bookings/
General Safety Guide

-These are the **general** rules for working in the shop and are covered in the general training/orientation, along with saws and drill press.

Equipment is expensive but **safety** is our main concern.

Anyone working in the manufacturing lab will have supervision and guidance.

For assistance with this form, contact the manufacturing laboratory office, EB278 815-753-5978
Quick Start Guides

* Each piece of equipment has a Quick start guide available that can be used for reference while training and anytime after.

* If at **any point** you are unsure of something or need advice feel free to ask one of the shop attendants for assistance.
Work Requests
When you need assistance…”WorkRequests”

- Sometimes the work you need is outside of your abilities or experience. **Work Requests** can be submitted for help from the Machine Shop staff.
- Remember every shop has limits, try to work within the resources available. i.e., machine capacity, power, depths of cut, complexity, skill of staff, hours of availability.
- **Use an Engineering Design Process** to develop solutions.

**ABET Definition of Engineering Design**

Engineering design is the process of devising a system, component, or process to meet desired needs. It is a decision-making process (often iterative), in which the basic sciences, mathematics, and the engineering sciences are applied to convert resources optimally to meet these stated needs.
Machine Shop Assistance

- Use our O365 Bookings app for:
  - Work Request Inquiries
  - Design Review
  - Maker Space / 3D Print Inquiries
  - Special Request Inquiries

https://outlook.office365.com/owa/calendar/CEETEBMachineShop@mail.niu.edu/bookings/
*When needing assistance from the machine shop follow the flow chart.

(Work request forms will be given to your advisor after consulting with your advisor and the machine shop staff)

*This Flow Chart can be used as a guide for planning your approach and determining how something will ultimately get done.

*Sometimes request will need to be completed by a third party due to size, complexity, timeline or specialized equipment.

*Materials are generally the responsibility of the student.
Instructions for Work Request / Assistance - ED Machine Shop

You can use the link below to set up a work request inquiry and then you can schedule a Teams meeting to discuss what you would like to do. This will help us determine if and how we can assist you.

https://outlook.office365.com/owa/calendar/CEETEBMachineShop@mail.niu.edu/bookings/

Once we have the initial work request inquiry meeting and we determine that we can assist with what you need, we will send (email) a work request form to the faculty member.

1. Discuss your request with your advisor or instructor BEFORE scheduling a work request / design review.

2. Once we have had a chance to meet and discuss the request the advisor will be sent a work request form. Be sure to include good phone numbers and emails so we can contact you with questions.

3. Be sure to give a good description of what you would like done, and attach any drawings. Depending on the request we may need copies of the files in the shop (DXF / SLDPR.T, STL etc.).

4. Once we receive the work request, we will fit it into our schedule as soon as we can. We will contact you when it is done or if there are questions.

Things to consider BEFORE scheduling a Work Request / design review:

We have a lot of experience. Ask us, we like questions.

How soon do you need it? ASK

What machines are available and most appropriate? ASK about size and capabilities.

Material and supplies. What are they and where are they coming from? ASK for suggestions.

Do you want to or able to do some or all some the work yourself? With guidance?

Software version and file compatibility. We don’t have every kind and version of software.

Transport, handling and logistics. Is the item or part heavy or large?

Skill and expertise of the Machine shop staff. We’re good but we don’t know everything.

Our machines, measuring equipment and tools still use the English system of measurement. Tolerance, XXX, preferred, check your settings there is a difference between .38 and .375. A .380 will not fit a .350 hole. Check your tolerances.

Rapid prototyping parts is not free. Supplies cost money check your file…again.

What is most important: fast, accurate or cheap? Pick 2.

Are your drawings complete? Could you make the part from your print?

College of Engineering & Engineering Technology, Dean's Office, EB 321

Technician Work Request

Please print legibly, missing information will slow down approval process.

Name: ____________________________ Date: ______________

If student, name of faculty member approving this request: ____________________________

Phone # (815) 753-5297

Project Name: ______________

Cost Center (if you had to pay for this service, where did the funds come from? This must be provided for approval of request): ______________

Area of Work (check one)

☐ Research

☐ Equipment Repair

☐ Instructional - List course: ______________

☐ Student project-not tied to a course: ______________

☐ Other: ____________________________

Location (if applicable): ____________________________ NIU Inventory Tag:

Detailed description of work. Please attach drawings or flash drive if needed. Please make Bennett known supplied material. Drawings attached: ______________

Bennett. PDF, DXF, .STL

Sample

Dr. ______________

Faculty signature approving request

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES

ANGLES ± .5° ± .02 ± .01 ± .005
3D printers (require .STL files)

- **FDM** (PLA material is typical, PETG and flex possible)- standard parameters; 20% infill, 0.3 mm layer

  *Prusa Mk3 FDM - 210mm x 210mm x 250 mm (8.3"x8.3"x 9.8“)
  Creality CR10s – 11.8" x 11.8" x 15.74“ (11.8 x 11.8 x 15.74)

- **SLA** (.STL files) SLA printer with various Formlabs materials
  *Formlabs Form 2 SLA - 145mm x 145mm x 175 mm (5.7"x5.7"x 6.8“)

CO2 Laser cutter / engraving (.DXF files)

*Universal laser 100w CO2 - 18x32 table approx. up to ¼ inch cutting / engraving (mat board, acrylic, etc.)
*Epilog laser 50w CO2 - 12x24 table approx. up to ¼ inch cutting / engraving (mat board, acrylic, etc.)

CNC, Vertical Mills, Lathe, OMAX waterjet (.dxf,.PDF,.sdlprt,.STEP- for CNC model import)

* mill, lathe, waterjet, sheet metal, CNC mill and lathe, bending
Do not email drawings unless asked…

We need to be able to open them and make sure the versions are compatible.

Drawings should be complete and include; material, quantity, and any special instructions.

Decimal inch units are preferred set your units and tolerance to ips (.XXX)

| UNLESS OTHERWISE SPECIFIED |
| DIMENSIONS ARE IN INCHES |
| ANGLES | .X | .XX | .XXX |
| ±.5° | ±.02 | ±.01 | ±.005 |

Discuss file types needed with the shop. i.e. pdf / .dxf / .sldprt / printout 1:1 / .stl

Different processes require different files. (laser, waterjet, CNC milling, Welding, fabrication/bending, rapid prototyping.)
Other Resources

• Senior Design Studio- EB 354 (24/7)
• Team Bench- tool box and secure cabinet
• Tinker Space- (24/7) drill press, sander and drill, dremel, jigsaw, etc.
• Maker Space- 3d printers, CO2 laser for thin woods and some plastics, hand tools and small bench tools and assistance
• Manufacturing lab (8-4:30)- welding / fab, mill, lathe, waterjet, sheet metal, CNC mill and lathe, CO2 laser, 3d printer, material handling, training, supervision, guidance and assistance

• Private shop-i.e. Walt ltd- local contract machining / fabricating, project sponsor…
• Xometry, Vention, Protolabs 3d print, e-machineshop – online job shops
Q- I have had the meeting, what is the next step?
A- Once we have the initial work request etc. inquiry meeting, and we have determined that we can assist with what you need we will send (e-mail) a work request form to the faculty member.

Q- How soon will I get my parts, what is the turnaround time?
A- Turnaround largely depends on complexity, scheduling and if we run into problems. Sometimes it’s less than a day, other times it could be weeks or months.

Q- Do you have any scrap?
A- We have some limited scrap, but shouldn’t you be specifying you materials more carefully????

Q - Do you supply materials, fasteners etc?
A – Not generally, we have a limited supply of common fasteners but we can help you decide what you may need and where you can get it. 3D prints that require small amounts of on hand material will generally be provided.

For certain projects and large amounts of material we ask that you provide material.

Q- Can I use the water jet, saw, mill etc. etc.?
A- Yes you can... after you have been trained and we have helped you decide the most appropriate machine / process.

Q- Can I work alone / after hours / this weekend?
A- Nope, not in the shop sorry. You will have to schedule your time around available resources.

Your “group” space and the EB354 “tinker space” are also available for students in Senior Design.
Design Considerations and Guidance
The college has a well-equipped general machine shop with milling, drilling, turning and fabrication capabilities. The shop has a mix of manual tool room type equipment such as Bridgeport knee mill, tool room lathes as well as CNC - Haas tool room mill, Proto Trak mill (3 axis) and tool room lathe (2 axis) as well as various other machine shop support equipment. (band saw, drill press, cutoff saw, hand tools)

In addition to normal machining capabilities, we have fabrication equipment such as Mig and Tig welding up to about 1/4-inch, sheet metal shears, benders, a 50 w 12x24 co2 laser used to cut acrylic and various other nonmetals.

The shop also is also equipped with an Omax-2 axis waterjet machine that can cut most materials economically up to .5 inch and occasionally up to 3 inch depending on materials.

We do not charge for our services but for planning purposes you should expect a shop to charge around $ 150.00 / hr. Also, be aware that our machine capabilities outpace our staffing and we do not have expert machinists able to routinely make high precision or production / job shop parts.

We do have a lab manager and two lab mechanic technicians that can help you decide on manufacturing approaches, materials and will guide you in safe machine operation.
Plan ahead...

The machine shop / manufacturing lab is tasked with supporting many areas of the college...

Instructional lab support – parts, fixtures, repair etc.
Research project and lab support – many varied projects and requests
Training and guidance for manufacturing lab equipment - student projects, research projects, instructional, team and club projects, events, engraving, truck and trailer training, etc. etc.

Some examples
MEE 320 – walker project
MEE 390 – Experimental methods, many different projects
MEE 331 – Manufacturing processes
MEE/ELE/ISYE/Tech – Senior Design multi disciplinary
ISYE 350 – Manufacturing Processes
Tech 260- Metal Fabrication Processes
Tech 362 – CNC
Tech 262- Machine Production Processes
Tech 420- Computer Integrated Manufacturing

In addition
Team/ club support- Baja, Formula, Super M, Aero, Snowmobile, Robotics, Mars Rover, etc...
DFM – Manufacturing – can it be made?
DFA - Assembly – how will it come together?
DFX - Lifecycle – how is it disposed / recycled what happens at the end of the semester?
A project contact card (3x5) **should** be posted on the workbench / work area to identify who to contact if there is a problem or assistance is needed.

<table>
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<th>Team #:</th>
<th>Project Name:</th>
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<tr>
<td>TA:</td>
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QUESTIONS, COMMENTS, DISCUSSION?
LAB TOUR

Any Questions?
# EB Machine Shop Equipment

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<th>Make</th>
<th>Model</th>
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