

Auburn University

Brown-Kopel Design and Innovation Laboratory:

Maintaining a Multi-Major Makerspace

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Introduction

Opened in Fall of 2020, the Brown-Kopel Design and Innovation Laboratory (DIL) is an interdisciplinary hub for all engineering majors where equipment and training allows students to create projects and pursue knowledge outside of

Training	Skill Level	Presentation	Quiz	vDemo	Demo	Cert	Access	Deactivate
Safety Agreement	Normal	✔	✔	✔	✔	✔	✔	✔
Basic Safety	Advanced	✔	✔	✔	✔	✔	✔	✔
Expert	Expert	✔	✔	✔	✔	✔	✔	✔
Craft World	Normal	✔	✔	✔	✔	✔	✔	✔
Advanced	Advanced	✔	✔	✔	✔	✔	✔	✔
Expert	Expert	✔	✔	✔	✔	✔	✔	✔
Powered Hand Saw	Normal	✔	✔	✔	✔	✔	✔	✔
Expert	Expert	✔	✔	✔	✔	✔	✔	✔
Prototype Shop	Normal	✔	✔	✔	✔	✔	✔	✔
Advanced	Advanced	✔	✔	✔	✔	✔	✔	✔
Expert	Expert	✔	✔	✔	✔	✔	✔	✔
Percentage Shop	Normal	✔	✔	✔	✔	✔	✔	✔
Advanced	Advanced	✔	✔	✔	✔	✔	✔	✔
Expert	Expert	✔	✔	✔	✔	✔	✔	✔
Laser Cutter	Normal	✔	✔	✔	✔	✔	✔	✔
Advanced	Advanced	✔	✔	✔	✔	✔	✔	✔
Expert	Expert	✔	✔	✔	✔	✔	✔	✔
Wood Shop	Normal	✔	✔	✔	✔	✔	✔	✔
Advanced	Advanced	✔	✔	✔	✔	✔	✔	✔
Expert	Expert	✔	✔	✔	✔	✔	✔	✔

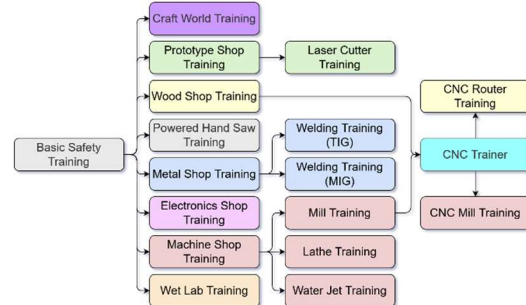
their nominal program of study. Recently, faculty have also been approved to host classes in a designated classroom area. With just over 11,000 square feet of area and equipped with 9 different shops along with a main work area, the DIL has room for both quick and ambitious projects as well as academic courses.

Capabilities

In addition to essential tools and machines for metal working, wood working, electronics, and additive manufacturing, the DIL hosts several machines that are generally unavailable for students of all majors to use such as a wire EDM, a waterjet cutter, a 3-axis CNC mill, CNC routers, a kiln, a sandblaster, and a dual extrusion printer capable of embedding high strength strands (carbon fiber, Kevlar, etc.) into prints.

Management

Using the website built on a LAMP stack, students must undergo trainings that consist of demonstrations and certification pieces administered by makerspace assistants (MAs) to access the space. After completing the basic safety training that grants access to the main work area, students are free to pursue access of the shop of their choice.



Each shop has different levels of certification that are proportional to knowledge of that specific shop. Some shops only grant access to certain equipment with higher levels of certification.

There are 3 levels of certification: Basic, Advanced, and Expert.

In addition to inspecting a printed badge, each MA can check progress of a user in each shop via a color-coded menu on the website.

Training Key	Normal	Advanced	Expert	Completed	Advanced	Expert	Muted	Inactive						
Name	W	BS	AW	PS	LC	WCS	MCS	WMT	MAS	ML	WL	CM	CS	CR
Jose Arquitolola - jaa0076	W	BS	AW	PS	LC	WCS	MCS	WMT	MAS	ML	WL	CM	CS	CR
Garon Griffiths - ggg0002	W	BS	AW	PS	LC	WCS	MCS	WMT	MAS	ML	WL	CM	CS	CR
Daniel Chapman - dgc0003	W	BS	AW	PS	LC	WCS	MCS	WMT	MAS	ML	WL	CM	CS	CR
Hampton Morgan - hcm0018	W	BS	AW	PS	LC	WCS	MCS	WMT	MAS	ML	WL	CM	CS	CR

In the case of a user needing to purchase hardware or request a 3-D print, a transaction can be recorded on the website. With a dedicated pages to materials and the printer queue, inventory can be efficient and organized.

All Inventory

Please note all materials and tools must be used in the Makerspace. Items cannot be removed to be used in fabrication in other areas unless strict approval given.

Name	Part Number	Cost/Unit	Unit	Category	Type	Location
0.1" Pin Headers	30053	\$0.00	each	Material	Electronics	Electronics Shop
2.1mm Jack	30048	\$1.00	each	Material	Electronics	Electronics Shop
9V Batt Connector	30046	\$0.50	each	Material	Electronics	Electronics Shop
9V battery	30060	\$1.50	each	Material	Electronics	Electronics Shop
>M7 Hardware	20009	\$0.23	each	Material	Standard Parts	Material/Tooling
Acrylic Sheet .118" - Clear	1UN08	\$0.03	square inch	Material	Stock/Material	Prototype Shop
Acrylic Sheet .177" - Clear	1UN09	\$0.06	square inch	Material	Stock/Material	Prototype Shop
Acrylic white sheet 0.177"	1UP84	\$0.05	square inch	Material	Stock/Material	Prototype Shop
Al 3003 Sheet 0.063"x12"x24"	3DR23	\$0.08	square inch	Material	Stock/Material	Metal Shop
Alligator Clamps	30043	\$0.20	each	Material	Electronics	Electronics Shop
Aluminum 0.04" - Gold	6062K2	\$0.08	square inch	Material	Stock/Material	Prototype Shop
Aluminum 0.04" - Silver	6062K3	\$0.08	square inch	Material	Stock/Material	Prototype Shop
Aluminum 0.04" - Black	6062K1	\$0.06	square inch	Material	Stock/Material	Prototype Shop
Aluminum 6061 Bar 1" x 4"	2E2X4	\$2.63	inch	Material	Stock/Material	Machine Shop
Aluminum 6061 Bar 1/2" x 4"	2E2L1	\$1.30	inch	Material	Stock/Material	Machine Shop
Aluminum 6061 Bar 2" x 4"	1ZD08	\$4.00	inch	Material	Stock/Material	Machine Shop
Aluminum 6061 Bar 3" x 3"	1ZD05	\$7.34	inch	Material	Stock/Material	Machine Shop
Aluminum 6061 Rod 1"	2EY09	\$0.29	inch	Material	Stock/Material	Machine Shop

New Transaction

Badge/Group ID: Maker Assistant ID:

Group Name: **Makerspace Asst**
Group Materials: **N/A**

Material/Service/Tool ID: Qty: Cost: Name: Category: Total:

Notes:

Involvement

The DIL collaborates with multiple student clubs across campus due to its capabilities. These clubs include:

- War Eagle Motorsports (Formula SAE team)
- Auburn Off Road (Baja SAE Team)
- Auburn University Rocketry Association

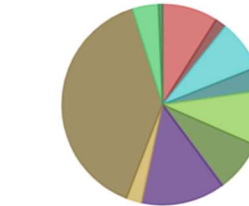
In addition to supporting student clubs, the DIL also supports university organizations and classes such as

- Auburn Makes
 - University-wide network of makers and fabrication resources
- Engineering Senior Design
 - 2 semester course that consists of the design and fabrication of a cumulative project of the entire engineering major
- Intro to Engineering
 - Freshman course intended to expose new student to engineering concepts
- Mechatronics
 - Special topic technical elective focused on electromechanical systems.
- Honors 3-D Printing Seminar
 - Honors college course that teaches students the operation of slicers and 3-D printers.
- Business-Engineering-Technology:
 - Degree minor that educates and trains selected engineering and business students to develop new products, business models, and business startups.

Demographics

The DIL aims to be inclusive of all majors and as such the percentage of users by major corresponds to the size of each respective major; the website also provides useful information on site activity.

Active Users by Major



Major	# Users	%
AERO	101	9%
BSEN	20	2%
CHEN	93	8%
CIVL	43	4%
COMP	100	9%
ELEC	93	8%
FacStaff	1	0%
INSY	152	13%
MATL	28	2%
MECH	444	39%
NonEng	48	4%
WIRE	7	1%
Total	1130	100%

Type	# Users
New Users (Site Specific)	620
Active Users (Site Specific)*	1130
Total Users (All Sites)	1712
Total Users (incl Reservations)	3082

User Activity by Semester

# Semesters	# Users
0	890
1	415
2	190
3	91
4	65
5	36
6	5
7	10
8	6
Total	1708

References

- [1] Auburn Brown-Kopel Makerspace information: "<https://eng.auburn.edu/makerspace>"