NC State University Libraries’ Makerspaces & 3D Print Services

Adam Rogers
Head of Making, NCSU Libraries
go.ncsu.edu/make
Overview
Our Goal

Offer a broadly accessible, truly interdisciplinary program of making and learning to all on campus.
Our Core Values

ACCESS
inclusive of all on campus

&

LITERACY
technology & data, processes, new ways of making things
Two Makerspaces

**Hunt Library**
- 3D Printing Service
- Advanced capabilities
- 6000+ 3D prints
- ~200 ft²
- est. 2013

**DH Hill Library**
- Hands-on, DIY Space
- Easy to learn tools
- 2000+ unique users
- ~900 ft²
- est. 2015
Hunt Library Makerspace
Technology Lending

- 1-week+ loan
- links to online tutorials, etc.

SUPPORTS
- self-directed & interest-based learning
- experimentation & play
Workshops

- Coding for Wearables
- Critical Making
- 3D Design (beginner & advanced)
- Sewing & Electronic Embroidery
- Arduino; Internet of Things
- Bookmaking
- Creative Coding
- Photogrammetry & 3D Scanning

… and more!
Course Support

MAKERSPACE INSTRUCTION STAFF

Lauren Di Monte
Jessica Elam-Handloff
Adam Rogers

RECENT COURSE COLLABORATIONS

Makerspace Instruction Support

Instruction Services
We're here to assist you in bringing the tools and technologies of the emerging maker movement to your classroom. No matter the discipline, level of expertise, technical or creative focus, we offer our knowledge and experience to help you integrate hands-on learning in your courses. These offerings include:

- Consulting on developing syllabi, course projects, and assignments
- Facilitating class sessions in the D.H. Hill Makerspace or other library venues
- Visiting your classroom to talk about library resources
- Providing individual project assistance to students by appointment
- Hosting final project presentations and galleries

Contact us now to get started!

Example Syllabi

Example Projects

Pedagogical Resources
Across the Disciplines

- Architecture
- Arts Studies
- Big Data
- Biomedical Engineering
- Chemistry
- Communications
- Digital Humanities
- English
- Fashion & Textile Design
- Microbiology
- Poultry Science

... and that’s just last fall!
Deeper Experiences

MAKE-A-THON

25 student teams. 3 campus sustainability challenges. 1 weekend.
2 Emerging Areas of Work

**WE LOOK FOR**
- opportunities for our users
- easy to learn tools
- literacies to develop

**ELECTRONICS**
Prototype and make electronics with easy-to-learn tools

**3D PRINTING**
Print physical things from digital models you design or download

**3D SCANNING**
Make 3D digital models of real-world objects

**CUTTING & MILLING**
Cut, etch, and mill with powerful digital tools

**WEARABLES**
Sew and create with textiles and integrated electronics

**INTERNET OF THINGS**
Connect physical things to the Web
Examples
### Analysis of Third Floor, Room C

<table>
<thead>
<tr>
<th></th>
<th>SUM TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Used With Reservation</td>
<td>311</td>
</tr>
<tr>
<td>Unused</td>
<td>36</td>
</tr>
<tr>
<td>Used Without Reservation</td>
<td>242</td>
</tr>
<tr>
<td>Unused With Reservation</td>
<td>47</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>636</strong></td>
</tr>
</tbody>
</table>

The visualization is a summary of the data captured for room C. The room rarely went unused (6%) of the time (49%) it was reserved. However, the usage without a reservation is 38%. It is believed that many people do not book it for themselves. It only went unused 13% of the time, 7% of which was with a door closed. All together, this room’s usage conflicts with the library’s reservation data, with online reservations made not being accurately reflected in the actual room's usage according to our data capture. This is a fairly significant flaw in N.C. State’s online reservations.
Chemistry Education
Biomedical 3D Printing

Non-NCSU Examples
3D printing technology is advancing at a rapid pace, but it is difficult to find or create 3D-printable models that are scientifically accurate or medically applicable. The NIH 3D Print Exchange provides models in formats that are readily compatible with 3D printers, and offers a unique set of tools to create and share 3D-printable models related to biomedical science.
Prosthetics (E-NABLE)
Exoskeleton ("Magic Arms")
Trachea Splint
Bioprinting
Organs?
How To
Use the Hill Makerspace

Makerspace

D. H. HILL LIBRARY
A D-I-Y creation and collaboration space

JAMES B. HUNT JR. LIBRARY
3D Printing services and more

UPCOMING WORKSHOPS

<table>
<thead>
<tr>
<th>Date</th>
<th>Event Title</th>
<th>Date Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEP 1</td>
<td>Getting Started with eTextiles</td>
<td>11:00 am to 1:00 pm</td>
</tr>
<tr>
<td>SEP 5</td>
<td>D.H. Hill Makerspace Orientation</td>
<td>9:15 pm to 10:00 pm</td>
</tr>
<tr>
<td>SEP 11</td>
<td>D.H. Hill Makerspace Orientation</td>
<td>5:30 pm to 6:15 pm</td>
</tr>
<tr>
<td>SEP 12</td>
<td>Using GitHub for Collaboration</td>
<td>11:00 am to 12:30 pm</td>
</tr>
</tbody>
</table>
LulzBot Mini

- Open filament system: PLA, ABS, TPE, Nylon...
- Robust hardware
- Open Source Hardware
How to 3D Print at Hill

Attend an Orientation to get access!

Bring:

- NCSU ID
- STL File to Print
- Ideas!

Buy our Filament with AllCampus
or Bring your own
3D Printers @ Hunt

LulzBot TAZ

Form 2

uPrint
How to 3D Print at Hunt

Visit Hunt Makerspace during open hours (Su-Fr 2-7pm). Bring:

- NCSU ID
- Credit/Debit
- File to Print (STL format)
3D Scanning (Checkout)
3D Scanning (Studio)

NextEngine 3D Scanner HD

- Full color, high resolution professional 3D scanner
- Uses NextEngine HD PRO software
- Can produce 3D-printable models (.STL format)
- Manufacturer’s details at www.nextengine.com
- Permanently set up in the VR Studio at DH Hill (Rooms 2317/18 in the West Wing)
- To use, reserve this studio, and check in at DH Hill Library’s Ask Us Desk when you arrive for your reservation
- The NextEngine manual is in the VR Studio with the scanner

SPACES
- VR Studio, Hill

SOFTWARE
- Autodesk Meshmixer
- MeshLab

Upgrades coming soon!
Laser Cutting / Milling
Learning Goals:
- Experiment with the fabrication of biomaterials.
- Collect, record, statistically analyze, and report experimental data related to the analysis of biomaterials.
Customized Instruction

Getting Started With 3D Printing
BME Edition

Prosthetics (E-NABLE)
Product
Connect Your Course

Sept. 15th
10am-12pm!

NC STATE Office of Faculty Development

TH!NK WORKSHOP: Making in Your Classroom

Are you curious about how the maker movement and maker technologies might impact teaching and learning? Do you want to explore new ways of incorporating technology into your curriculum? This workshop will introduce you to a number of tools available in the D.H. Hill Library Makerspace and offer insights into how making methods can supplement and extend critical engagements with course content.

In this hands-on session you will:

- Learn about the making resources offered through NCSU Libraries;
- Discover how your peers have incorporated making tools and methods into their classrooms;
- Get hands-on experience using Makerspace tools, including 3D printers and scanners, electronics prototyping kits, and CNC machines;
- Brainstorm ways to incorporate making and doing into your assignments.
More to Explore
Making Space series

Empowering Makers with Danielle Applestone, CEO of Other Machine Co.

October 18th

Multiscale Design: From bacteria to buildings with Annelie Koller

November 8th
VR Studios @Hill/Hunt
Technology Lending: Virtual Reality

Technology Lending: Augmented Reality
Your Subject Specialist

Alex Carroll
Research Librarian for
Engineering and
Biotechnology

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Phone: 919.515.6602
Example Services

- **Literature Searching**
  - Keyword generation
  - Search string optimization
  - Citation chaining
  - Systematic reviews
- **Writing and Publishing**
  - Reference managers
  - Journal prospecting
  - Authors’ rights
- **NIH / NSF Grants**
  - Data management plans
  - Public access compliance
- **Research Impact**
  - h-index
  - Tracking citation counts
- **Researcher Profiles**
  - NIH / NSF Biosketch, ORCID, etc.
Makerspaces @ UNC

Be A Maker: beam.unc.edu

Kenan Science Library
library.unc.edu/makerspace/
Questions?
Thanks!

More info: go.ncsu.edu/make
Contact me: asroger2@ncsu.edu
Contact Dan: dmhawkin@ncsu.edu