

3D Printing—Learn by Building

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UConn 2016 fall

Summary

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 - ▶ introduces the principles in 3D printing.



- ▶ offers a hybrid learning experience that focuses on the **mechatronics** and **design** of 3D printing machines.

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You will do:

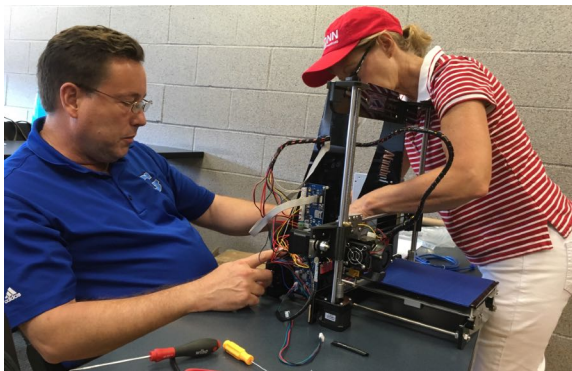


Figure 1: 12 high-school teachers built 5 3D printers within 3 hours (2016 UConn Joule Fellows Program)

learn:



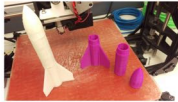
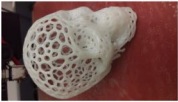
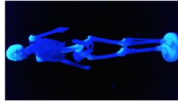
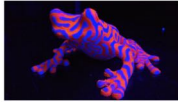
CAD Training

and use:

The screenshot shows the 'Machine Control Panel' software interface. It is divided into several functional areas:

- Initialization:** Contains buttons for 'Disconnect', 'Print', and 'Pause'. Below these are fields for 'Part' (set to 'M100M7'), 'Baud Rate' (set to '250000'), and a 'Verbose' checkbox.
- Position Readout:** Displays the current coordinates for X (0.00), Y (120.00), and Z (5.00). Each coordinate has a 'Zero' button. A prominent yellow 'EMERGENCY STOP' button is located to the right, with a 'Force Next' button below it.
- Accessory Control:** Features a dropdown for 'Active Toolhead' (set to 'Tool 0'). It includes controls for 'Extruder' (set to 29°C) and 'Heated Bed' (set to 30°C), each with 'On' and 'Off' buttons. A 'Set Fan Speed' slider is also present.
- Custom Commands:** A section with buttons for 'Disable Motors', 'Enable Motors', 'Print from SD Card', 'Pause Current SD Print', 'Upload to SD Card', and 'SD Card Status'. Below these are three 'Macro' buttons (Macro 1, Macro 2, Macro 3).
- Override Settings:** Contains two rotary dials for 'Movement' (set to 100%) and 'Extrusion' (set to 100%). The Movement dial has markers at 1%, 20%, 50%, and 150%.
- Log/Status:** A large text area on the left shows a stream of 'SENT: M105' and 'RECEIVED: ok T:29.4 J:0.0 B:30.0 J:0.0 T:29.4 J:0.0 B:30.0' messages. At the bottom of this area is a 'Send' button and a prompt '>>> INSERT THE G-CODE HERE <<<'. Above the log area are tabs for 'G-Code Library', 'Communication', 'Temperature Plot', and 'Jog Controls'.

with a goal of making:



and more importantly, to develop *creative thinking* about the involved *sciences* and *engineering*.



Figure 2: New York Times (future) ad on Nov. 11, 2014

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- ▶ *contextual learning*:
 - ▶ extensive **hands-on** activities—you will build 3D printers and participate in a design competition

Blended learning

- ▶ course website: <http://wp.handson3d.engr.uconn.edu>
- ▶ announcement and modules: huskyCT (lms.uconn.edu)
- ▶ pre-class reading assignments
 - ▶ watching videos
 - ▶ online “creative thinking” modules
- ▶ post-class assignments
 - ▶ CAD design
 - ▶ assembling
 - ▶ creativity tests
- ▶ in-class quizzes
- ▶ more details in syllabus

Online e-learning module

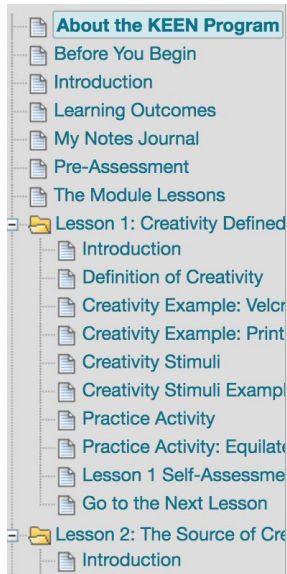
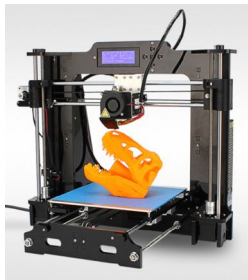
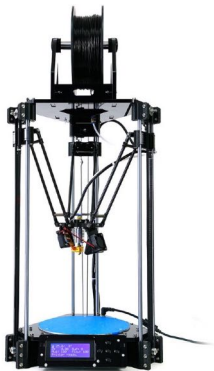


Figure 3: KEEN learning module on creative thinking

Kit building and design competition



Kit building and design competition

- ▶ work in teams of 3 to 5
- ▶ final design competition at the Student Union
- ▶ evaluation metrics:
 - ▶ Kit Building
 - ▶ Modeling & Creativity
 - ▶ Technical Competence

Grades

- ▶ Participation: 5%
- ▶ In-class and online quizzes: 15%
- ▶ Homework: (5*3%=)15%
- ▶ 3D printing kit building: 15%
- ▶ Design competition: 30%
- ▶ Presentation and report: 20%

There will be rewards

- ▶ opportunity to obtain a Solidworks certificate
- ▶ winning team will receive an honorary plaque

It will be different

- ▶ there will be times that we encourage/need you to use computers in class
- ▶ some online contact will displace some portion of the face-to-face class

Instructors

- ▶ Prof. Xu Chen, Mechanical Engineering
 - ▶ Office: UTEB 382
 - ▶ Phone: (860) 486-3688
 - ▶ Email: xchen AT uconn.edu
 - ▶ Office Hour: Wednesday 1:00pm-2:00pm
- ▶ Adam Wentworth, Materials Science and Engineering
 - ▶ Office: ENGR II 303
 - ▶ Phone: (860) 639-6961
 - ▶ Email: adam.wentworth AT uconn.edu
 - ▶ Office Hour: Monday 2:00pm-3:00pm

Teaching Assistants



- ▶ Leslie Prunier (leslie.prunier@uconn.edu)
 - ▶ Office Hour: Mon (12:00pm-3:15pm), Wed (3:30pm-5:00pm), Thur (9:30am-2:30pm) (tentative location: Homer Babbidge Library, 3D Printing Studio)
- ▶ Stephen Hawes (stephen.hawes@uconn.edu)
 - ▶ Office Hour: Mon-Wed (8:00am-12:00pm) (tentative location: Homer Babbidge Library, 3D Printing Studio)

What's next

- ▶ complete pre survey in huskyCT
- ▶ form teams by Week 2