

LINC 84E: LASER CUTTER FUNDAMENTALS

Foothill College Course Outline of Record

Heading	Value
Units:	1
Hours:	1 lecture per week (12 total per quarter)
Advisory:	Experience with basic computer and internet functions; experience with vector-based graphic design software is recommended, but not required.
Degree & Credit Status:	Degree-Applicable Credit Course
Foothill GE:	Non-GE
Transferable:	CSU
Grade Type:	Letter Grade (Request for Pass/No Pass)
Repeatability:	Not Repeatable

Description

Intended for makerspace educators and interested makers, this course provides an overview of the safe use and maintenance of laser cutter machines. Students design and produce projects on the laser cutter, using a variety of materials (cardboard, paper, wood, acrylic, stone, glass, fabric) and serving a variety of functions (flatpack assembly, art, display, engineering solutions). Advanced topics include rotary tools, filtration methods, machine maintenance, and bed installment/changes. Special emphasis will be placed on reinforcing design thinking concepts and the development of laser cutter makerspace projects to meet the needs of a variety of users.

Course Objectives

The student will be able to:

1. Identify the major parts and functions of a laser cutter and explain the role of each part in the machine's operation.
2. Correctly determine which settings to use, including power, speed, and z-axis adjustments, in order to cut and/or engrave a variety of material types.
3. Identify and describe the properties of materials that cannot be cut and materials that can cause risk or hazards, and practice safety protocols to mitigate risk and eliminate hazards.
4. Perform machine cleaning and maintenance routines to ensure ongoing machine performance and safety.
5. Design and produce engravings using a variety of materials, correctly selecting the appropriate settings for the design and the material.
6. Design and produce three-dimensional objects by cutting and assembling flat materials.
7. Engrave designs on rounded objects using the rotary tool.

Course Content

1. Parts and functions
 - a. Laser generator
 - b. Lenses and mirrors

- c. Frame
 - d. Laser cutting head
 - e. CNC system
 - f. Bed
 - g. Filtration system
 - h. Control platform
 - i. Model diagram of parts in operation
2. Settings
 - a. Material identification
 - b. Power
 - c. Speed
 - d. Z-axis
 - e. Caliper measurements
 - f. User interface for control platform
 - i. Graphics placement and movement
 - ii. Duplication and spacing
 - iii. Laser preview settings
 - iv. Timing preview settings
 - g. Performing test cuts
 3. Materials and hazards
 - a. Stone and glass
 - b. Cardboard and paper
 - c. Fabrics
 - d. Acrylics
 - e. Woods
 - f. Fire risks
 - g. Safety protocols for flame and fire
 - h. Off-gas risks
 - i. Safety protocols for air filtration
 - j. Hazardous materials
 4. Cleaning and maintenance
 - a. Bed removal and cleaning
 - b. Lens removal and cleaning
 - c. Laser cutting head maintenance
 - d. CNC motor maintenance
 - e. Leveling the bed
 - f. Troubleshooting issues
 5. Engravings
 - a. Converting designs
 - b. Line stroke, fill, and color requirements
 - c. Setting variable engrave and cut functions
 - d. Material engraving considerations
 - i. Wood
 - ii. Acrylic
 - iii. Stone
 - iv. Cardboard
 - e. Masking procedures
 - f. Design placement and adjustment
 6. Three-dimensional design
 - a. Box design and measurement considerations
 - b. Edge joints

- i. Flat
 - ii. Finger
 - iii. T-slot
- c. Material thickness accommodations
- d. Notches and dividers
- e. Kerf bending
- f. Weight-bearing stand design
- 7. Rotary tool
 - a. Function and process
 - b. Installing and troubleshooting
 - c. Setting y- and z-axes
 - d. Calculating object radius
 - e. Document set-up and formatting
 - f. Design placement and adjustment
 - g. Object placement and rotation

Lab Content

Not applicable.

Special Facilities and/or Equipment

1. When offered on campus: Lecture room equipped with computer projector system, whiteboard, and internet connectivity. Makerspace or computer laboratories with internet connectivity and computers or internet enabled devices running standard operating systems (e.g., iOS, MacOS, Windows, Android, Linux), and laser cutters
2. When taught online via Canvas students must have current email accounts and/or ongoing access to computers with email and web browsing capability

Method(s) of Evaluation

Methods of Evaluation may include but are not limited to the following:

Designing and developing makerspace projects and products
 Presenting the product or project to peers, capturing feedback, and using it to revise the product or project
 Making constructive contributions to class discussions and peer review feedback

Method(s) of Instruction

Methods of Instruction may include but are not limited to the following:

The student will be writing notes, listening, and participating in lecture presentation
 The student will be observing an instructor-led demonstration and/or actively practicing the demonstrated skills
 The student will be presenting and communicating their ideas in discussion and/or participating in peer reviews

Representative Text(s) and Other Materials

Riley, Erin, and Sylvia Libow Martinez. The Art of Digital Fabrication, 1st ed., 2019.

Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments

1. Writing assignments include a major course project and multiple developmental projects, online discussion response, and critical analysis of peer's educational projects.
2. Outside assignments include conducting project development, planning, reading, and developing the project through an iterative process.
3. When taught online these methods may take the form of video, audio, animation and webpage presentations. Writing assignments are completed online.

Discipline(s)

Instructional Design/Technology