

Mechanical Book of Pins

Rank: Rookie - knows how to use the basic shop equipment

Safety

Requirements & Evaluation:

1. Reads and understands safety guidelines
 - a. Has Taken Safety Quizzes
 - b. Has *Laboratory Acknowledgement Form* signed

Closet Organization (in person)

Requirements & Evaluation:

1. Knows where tools and materials are in the closet and shop
 - a. Can place tools in the correct locations

Machinery 1 (in person)

Requirements & Evaluation:

1. Bandsaw
 - a. Straight cuts
 - b. On Wood and Polycarb
2. Drill Press
 - a. On Wood and Polycarb
3. Belt Sander
 - a. On Wood and Polycarb

Tools 1

Requirements & Evaluation:

1. Knows how to use (during a pandemic)
 - a. Wrench
 - b. Nut Driver
 - c. Hammer & Awl
 - d. Clamps
2. Knows how to use (in-person)
 - a. Screw Driver
 - b. Ratchet

Rank: Apprentice - knows how to build with a cad drawing

Engineering Process

Requirements & Evaluation:

1. Learns Engineering Process
 - a. Applies it to an ice breaker that requires something built

Machinery 2

Requirements & Evaluation:

1. Bandsaw
 - a. Curved cuts
 - b. On metal
 - c. Can make adjustments
2. Drill Press
 - a. Changes drill bits
 - b. Can make adjustments
 - c. Knows to use various clamps
3. Belt Sander
 - a. Knows which sander to use
 - b. Knows when a new belt is needed

Tools 2

Requirements & Evaluation:

1. Knows how to use File
 - a. Knows which file to use
2. Knows how to use Power drill
 - a. Can drill a hole accurately
 - b. Can add and remove wood screws

CAD 1

Requirements & Evaluation:

1. Knows how to read CAD drawings
2. Should be given drawing and capable to make the part with little assistance

Rank: Master - can build basic mechanisms

Machinery 3 (in person)

Requirements & Evaluation:

1. Sanders
 - a. Horizontal Curve
 - b. Vertical Curve
2. Drill press
 - a. Stepping drill bits
 - b. Stacking pieces
3. Horizontal Bandsaw
 - a. Can cut a piece of wood

Tools 3

Requirements & Evaluation:

1. Knows how to use Dremel
 - a. Knows how to change the heads of the dremel
 - b. Knows which head to use and when
2. Knows how to use Jig Saw (not during a pandemic)
 - a. Can cut a wooden board
 - b. Can cut sheet metal

CAD 2

Requirements & Evaluation:

1. Knows how to use Part Studios
 - a. Can sketch and make parts
 - b. Can assign densities
 - c. Can create a 1:1 drawing
 - d. Can create a multi-view drawing
 - e. Can cad a simple object

Robot Design 1

Requirements & Evaluation:

1. Has a basic understanding of FRC robot design
 - a. Wheels, Drivetrains, Chassis Fabrication, and Materials
 - b. Discuss Chapters 1-4 from [Roboting: A guide for Total Noobs](#)

Rank: Wizard - can build more complex mechanisms

CAD 3

Requirements & Evaluation:

1. Knows how to use Assemblies
 - a. Can use the various Onshape tools to “Mate and Flush” parts
 - b. Can find the mass properties
 - c. Keeps bolts and nuts in mind
2. Optional during pandemic
 - a. Can make use of cad drawings
 - b. Use 1:1 CAD drawings to cut and drill pieces
 - c. Print out drawing 1:1
 - d. Tape on the piece and cut out
 - e. If making multiple of same pieces, clamp and drill through them simultaneously

Robot Design 2

Requirements & Evaluation:

1. Know about Mechanisms, Manipulators & End Effectors, Basic Pneumatics, FRC Legal Motors
2. Knows how to mount make use of pneumatics and motors
3. Discuss Chapters 5-8 from [*Roboting: A guide for Total Noobs*](#)

Advanced Fabrication 1

Requirements & Evaluation:

1. Gearing, Gearboxes, and Power Transmission
2. Knows how to turn a rod with a motor using gearing
3. Can align and fit bearings for axles
4. Belts
5. Learn about the VEX gearbox
 - a. Disassembling one
 - b. Understanding its components
 - c. Reassembling it
6. Discuss Chapters 9-10 from [*Roboting: A guide for Total Noobs*](#)

Rank: Legend - can apply advanced concepts and fabricate parts with precision

Advanced Fabrication 2

Requirements & Evaluation:

1. Knows about springs and pulleys
2. Considering the strengths of materials and design
3. Can use Mathcad for analysis after design and before build
4. Can calculate values for projectile motion

Special Equipment

Requirements & Evaluation:

1. Knows how to use the Lathe
 - a. https://drive.google.com/file/d/0By1h7AW8g3_9dHNhR1IWZDNOM0xsU0UySnZNSFJfVmZ6S1ZJ/view?usp=sharing
2. Knows how to use the 3D Printer
 - a. Knows how to format and print
3. Knows how to use the Mill or CNC