







Additive Manufacturing Capabilities:

Machine	Process	Product Example	Description	Material	Layer Thickness	Min feature size	Max build area	Support?	Speed	Cost of material	Cost of support	General use/notes:
3D Systems Z450	3D Printing		3d printing operates one layer at a time by spreading a layer of powder, and printing a binder in the cross-section of the part using an inkjet print head, along with color ink. Parts are then removed from the powder, and infiltrated with an acrylimide glue to give parts strength.	Plaster type material	.004"	0.020"	8" x 10" x 8"	None. Loose powder is easily removed. Trapped powder charged as solid material.	Fast	\$8/cubic inch	n/a	<ul style="list-style-type: none"> • Able to print in color, with mapped photos and text. • Best suited for quick, initial models. • Parts are not strong, can break if dropped. • Lowest cost, quickest method of RP.
Stratasys Fortus 250mc	Fused Deposition Modeling		FDM functions by extruding an ABS or PLA string through a heated nozzle, allowing plastic to flow and bond. A material and support nozzle extrude materials layer by layer, building a component by fusing the semi-molten plastic strings into a solid part.	White or colored ABS	.007", .010", .013"	0.020"	10" x 10" x 12"	Yes. Water-soluable, removed in cleaning tank.	Slow	\$5/cubic inch	\$7.50/cubic inch	<ul style="list-style-type: none"> • Best used for solid, functional components. • Can print in only one color. • Direction of build influences strength of part.
FormLabs Form 2	Stereolithography		Stereolithography functions by curing a photosensitive resin via a laser. The Form 2 operates "upside down", and builds parts hanging from a build platform, submerged in a pool of resin. The part slowly emerges attached to the build platform, hanging upside down.	Clear, White, Gray, Black	.001", .002", .004"	0.020"	5.7" x 5.7" x 6.9"	Yes. Support constructed using same material as the build, and must be manually removed.	Medium	\$.30/mL	\$.30/mL	<ul style="list-style-type: none"> • High resolution features • Small feature material properties & strength equal to bulk part. • Internal geometry and channels possible - Liquid resin must be able to be flushed out.
Stratasys Connex 350	Polyjet - Droplet Deposition Stereolithography		DDS uses 8 print heads to expunge a photocurable resin and support, onto a build plate. These materials are then cured via a UV light to solidify the part. 2 Core material types can be combined during a single print, allowing up to 14 different digital materials to be included in a single part.	Rigid Opaque, Flexible rubber-like, High Strength ABS, Transparent, Polypropylene-like	0.001"	0.003"	13.8" x 13.8" x 7.9"	Yes. Gel-like, removed via high pressure waterjet	Medium	\$.35-.40/ gram	\$.20/gram	<ul style="list-style-type: none"> • Can print multiple materials in the same print. • Highest resolution features only available without support material • Highest resolution layers, resulting in best-finish and appearance.
3D Systems Phenix PXS	Direct Metal Laser Sintering		DMLS uses a focused laser beam to cure metal powder to a solid part through a melting process. Successive metal powder layers are then deposited on top of a solidified layer, allowing the laser to bond material to previously formed layers of metal.	Stainless Steel 17-4 PH 94 - 98% dense	0.001"	0.004"	3.9" x 3.9" x 3.1"	Yes. Support structure is metal - removal is done manually by requesting party.	Medium	\$.50-.60/ gram + \$30 setup fee	\$.50-.60/ gram	<ul style="list-style-type: none"> • Highest strength parts - truly usable in high load and real-world applications. • Support structure is firmly attached, and requires manual finishing.

Other Capabilities

Romer Absolute Arm 7535 SI	Laser Scanning		The Romer Absolute arm is an arm-style laser scanner, capable of high resolution metrology. The arm is operated via GeoMagic, the software package which interfaces with the scanner, and in which users manipulate data to a usable surface.	n/a	n/a	0.0040" system accuracy	11.5 feet measuring range	n/a	Slow. Scanning is done manually by hand.	n/a	n/a	<ul style="list-style-type: none"> • Requestors who wish to use the scanner will be instructed on the laser scanning process, and given a brief tutorial on the GeoMagic Software • Scanning and data interpretation to final surfaces are the responsibility of the requestor.
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Rapid Prototyping Part Request Process:

1. Generate ".STL" files of each individual part to be prototyped.
2. Contact the Lab Email Address: **rp.lab@northwestern.edu**. Initial request email should include the following:
 - STL File of each individual part to be printed
 - Quantity of each part file to be printed
 - Machine & Material choice for each part file to be printed
 - Non-grant chartstring account number to charge build costs
3. Meet with RP lab staff during office hours to review machine and material options, and finalize remaining details.
 - A meeting is only required for first-time requests of each part. Iterations & revisions may be requested without requiring a meeting.
 - Precise quotes can be provided at this meeting
 - Significant part changes or new part requests require a new meeting.
4. Your part will be added to the build queue, and printed once the selected machine is available.
5. The lab will notify the requestor via email when the part is ready for pickup.