Innovative Manufacturing

Presented by MATEC NetWorks

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MARICOPA COMMUNITY COLLEGES

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National Science Foundation

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Executive Director/ Principal Investigator

www.matecnetworks.org

Webinar Host **Lara Smith**

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Who is EMS?

- Focused on rapid product development tools
  - Founded in 2001
  - Offices in Tampa, Detroit, Atlanta
  - Year after year growth
- 25+ years of Design, Engineering & Mfg Experience
- Focused on 3D Scanning, Product Design & Rapid Prototyping

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Objectives for Part I of Discussion

Overview of 3D Scanning Technology

A device that collects data of objects shape and possibly its appearance (i.e. color). That data can then be used to construct a 3D CAD model

Application for Product Design

With CAD Software, develop a mathematical representation of any 3D surface or object. You can also use other tools to help develop your project (i.e. 3D Scanner)

Innovations in Rapid Prototyping

Additive manufacturing technology, that takes CAD files and slices up them up into, virtual horizontal cross-sections and then creates physical successive layers until the model is complete

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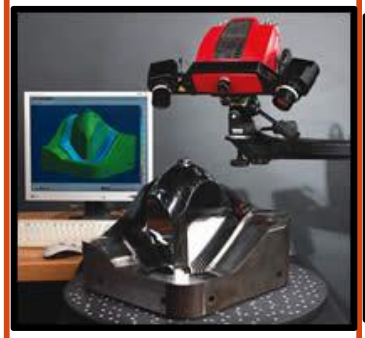
3D Scanning

❖ 3D Scanning Technologies - Types

Type	White Light	Laser	Touch	Long Range
				
Process	White light pattern is projected onto the part. Camera's pick up distortion of pattern	A laser stripe is passed over the part and picked up by cameras	A touch probe is mounted onto a mechanical arm. Data is collected one point at a time or with a laser attachment	Laser and radar are used to capture the data
Manufacturers	Steinbichler, Atos	Z Corp, Konica-Minolta	Faro, Romer, MicroScribe	Leica, Faro, Surphaser
Pro's	Excellent detail & accuracy	Good detail & accuracy. Many price points.	Excellent accuracy	Scan very large objects quickly
Cons	Expensive, complex, skilled operator, light sensitive, not very portable	Translucent and shiny parts can be challenging	Limited reach, not very portable, expensive, scanning is an add-on	Expensive, large data sets

3D Scanning

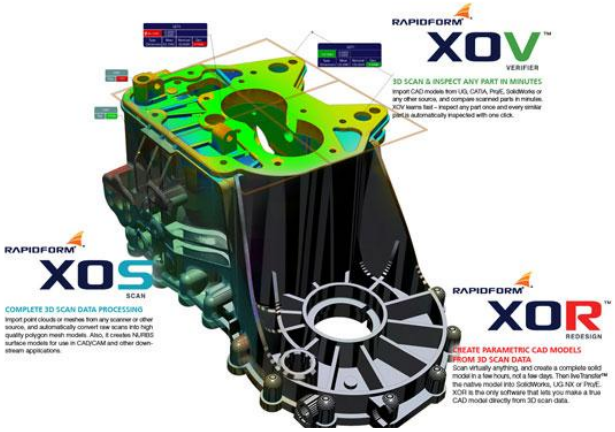
❖EMS – 3D Scanning Technologies

	Surphaser	Z Scanner	Konica-Minolta
			
Process	Phase base hemispherical 3D scanner	Laser scanner Hand held Continuous scanning	Laser scanner Tripod mounted, turntable
Model	25hSX	Z600, Z700, Z700xc, Z700px, Z800	Virtuoso, Vivid 910, 9i, Range 5, Range 7
Description	Unmatched high accuracy scanning for medium to large objects	Very portable, good accuracy Good resolution	Excellent accuracy and resolution. Multiple lenses for varying size parts Scans more surfaces without prep
Base Price	95K	29K – 70K	18K – 80K

3D Scanning

❖3D Scanning Software - RapidForm

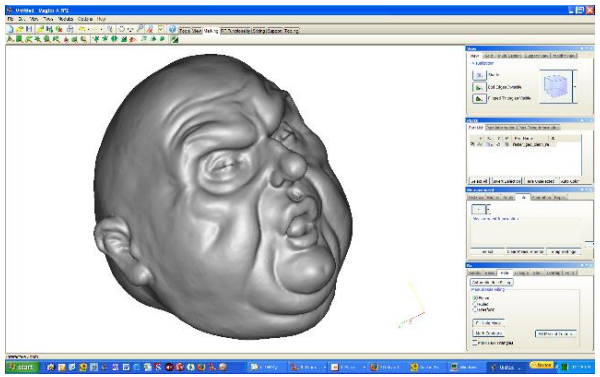
- XOR - Class leading reverse engineering software
- Ability to create surface & solid models
- Analyze scan data to CAD data
- Live transfer to SolidWorks, Siemens NX, AutoCAD, Pro/E
- Neutral formats – STEP, IGES, ParaSolid, etc
- XOV - Verification module
  - Inspection
  - GD&T
  - Inspection reports
  - Report Automation



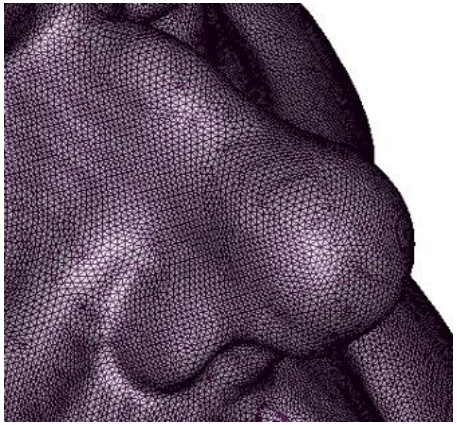
3D Scanning

❖3D Scanning Process

Scan part



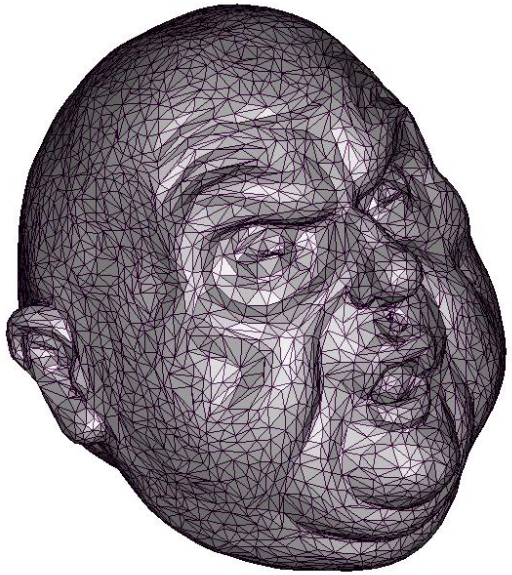
Edit, repair & change scan data in software



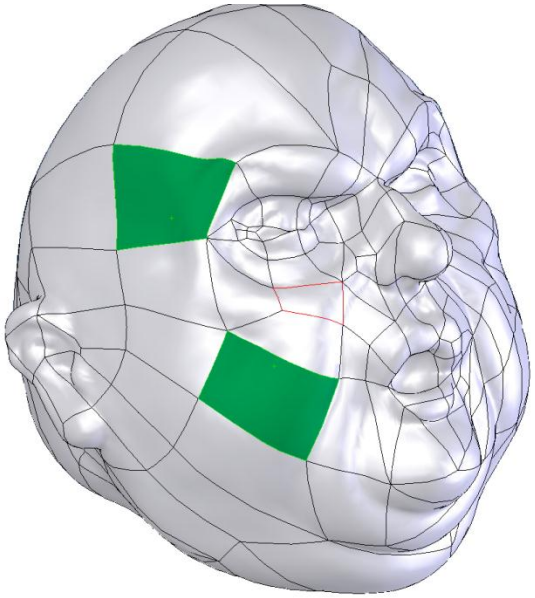
Output

3D Scanning

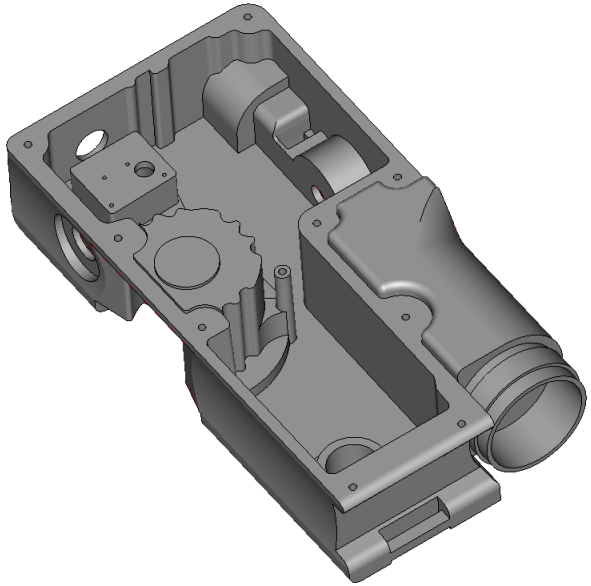
❖3D Scanning Output Options



Polygon File
- STL
- PLY
- VRML
- OBJ



Surface Model
- STEP / IGES / Parasolid / CATIA

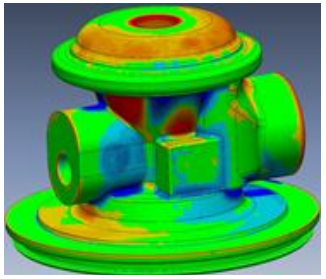


Parametric Solid Model
- STEP / IGES / Parasolid / CATIA
- SolidWorks / NX / Pro/E / ACAD

3D Scanning

❖3D Scanning Uses

- Reverse engineering
  - Legacy part – no CAD data
  - CAD data not available – 50% of all projects
- Packaging
- Aftermarket parts
- Digital archiving
- Art, archeology
- Forensics
- Inspection
- Animation / trainers



Sample 3D Scanning Project

LAV Military Vehicle

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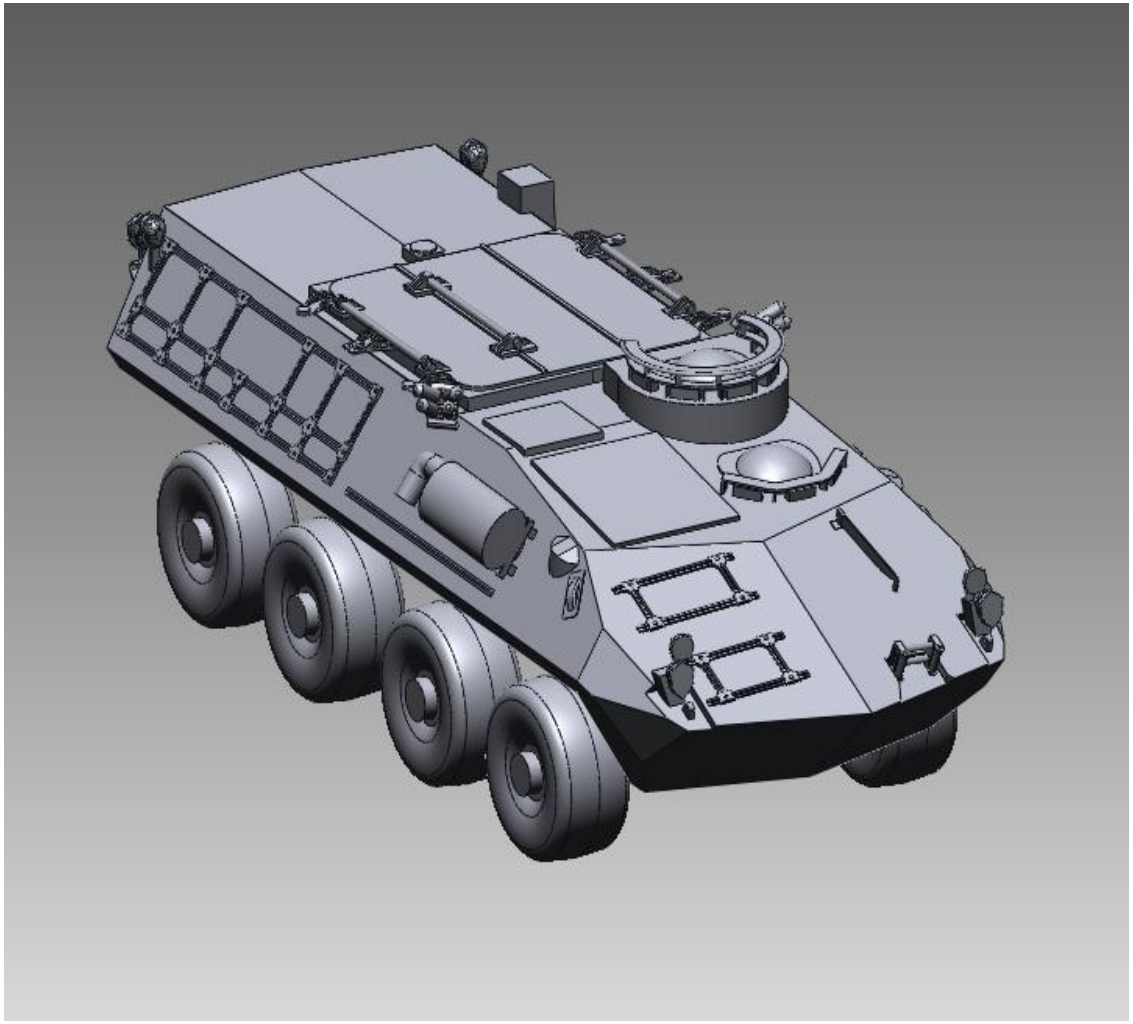
Sample 3D Scanning Project

LAV Military Vehicle

Sample 3D Scanning Project



LAV Military Vehicle

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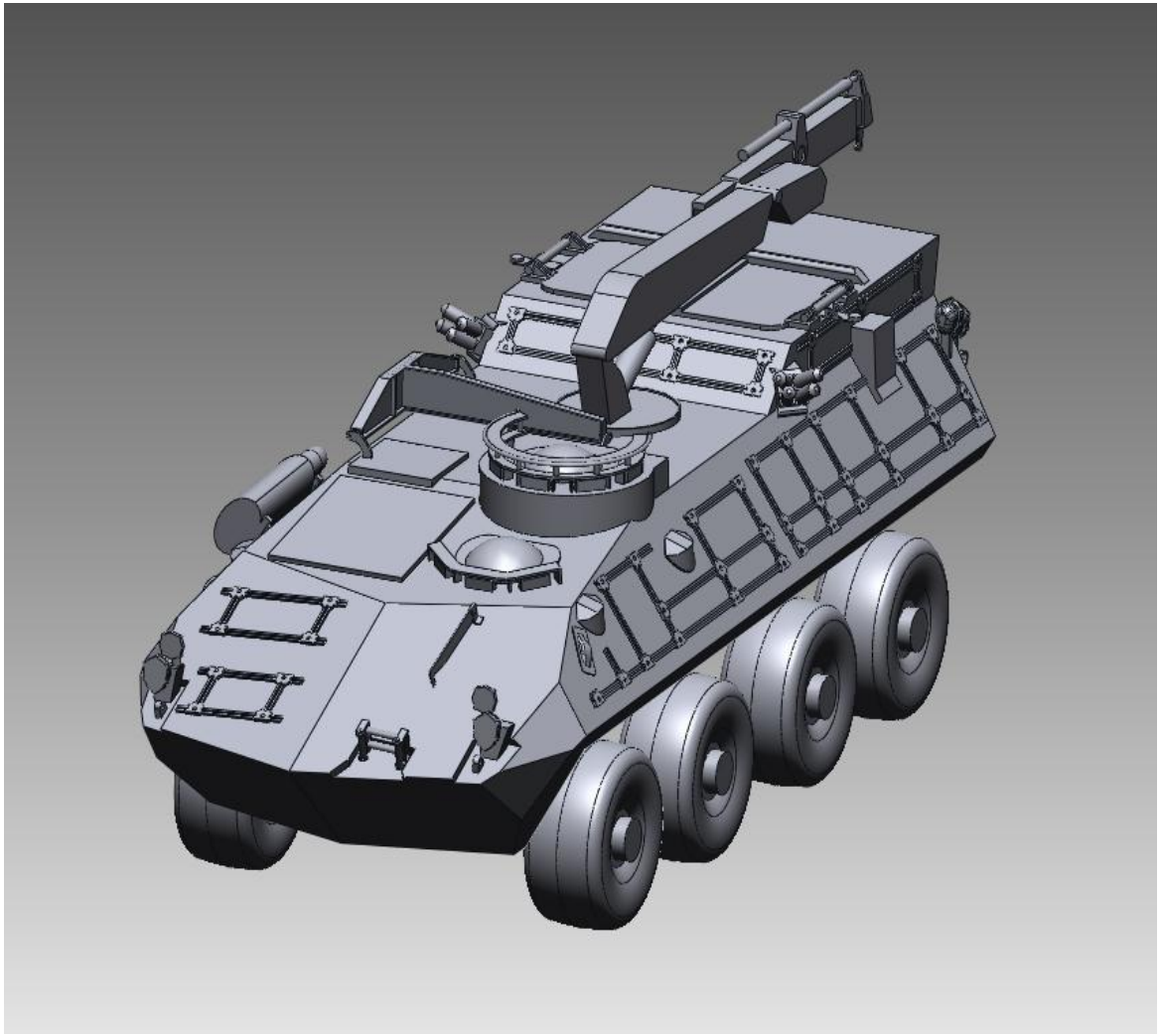

LAV Military Vehicle

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What % of all new products go through at least one scanning/rapid prototyping stage?

A = 32%

B = 51%

C = 73%

D = 86%

E = more than 90%

(Click on the correct answer button above the Participants' Box)

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What % of all new products go through at least one scanning/rapid prototyping stage?

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3D Scanning

- 3D Scanner Demo

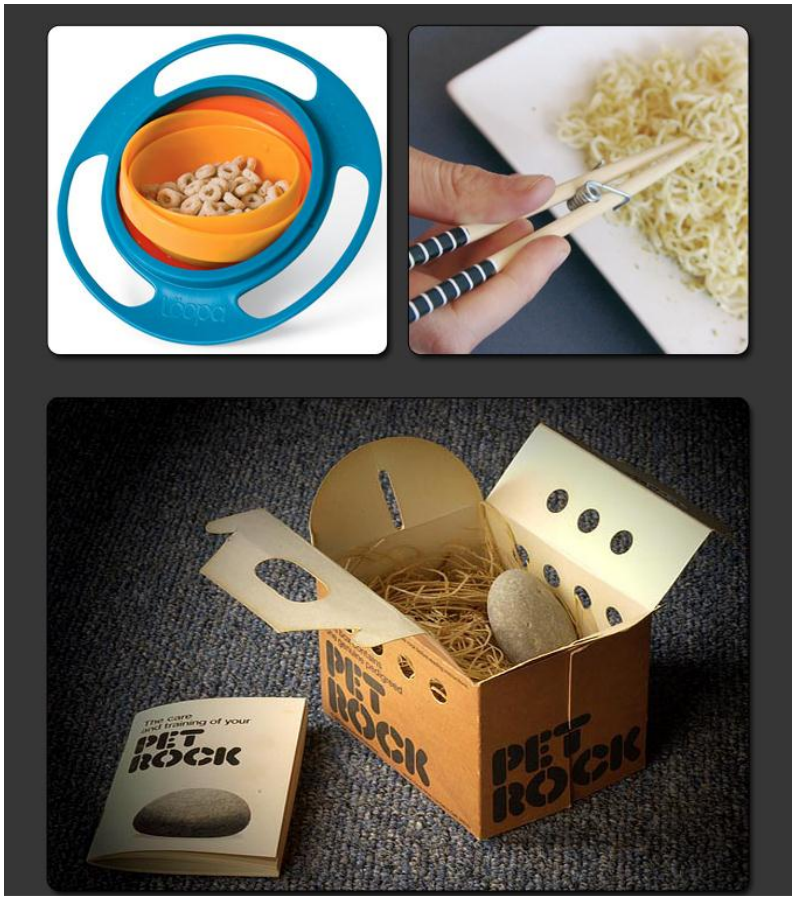
http://www.youtube.com/watch?v=Keu_0zXwUH8

Product Design

- Why Invent Something???

Challenge
- Complicated
- Serve a need
- Will people really buy it
- Cost to develop
- Who will do the work – design, manufacturing, marketing, distribution

Rewards
- Accomplishment
- Solves a problem
- Personal growth
- Financial freedom



Product Design

❖Do It Early – Do It Often

- Design Engineers influence 70 to 80% of a products total cost.*
  - Work with your suppliers early
  - Proper selection of materials
  - Reduce “over engineering”
  - Determine manufacturing costs earlier
  - Changes cost more as you move through the process

Product Design

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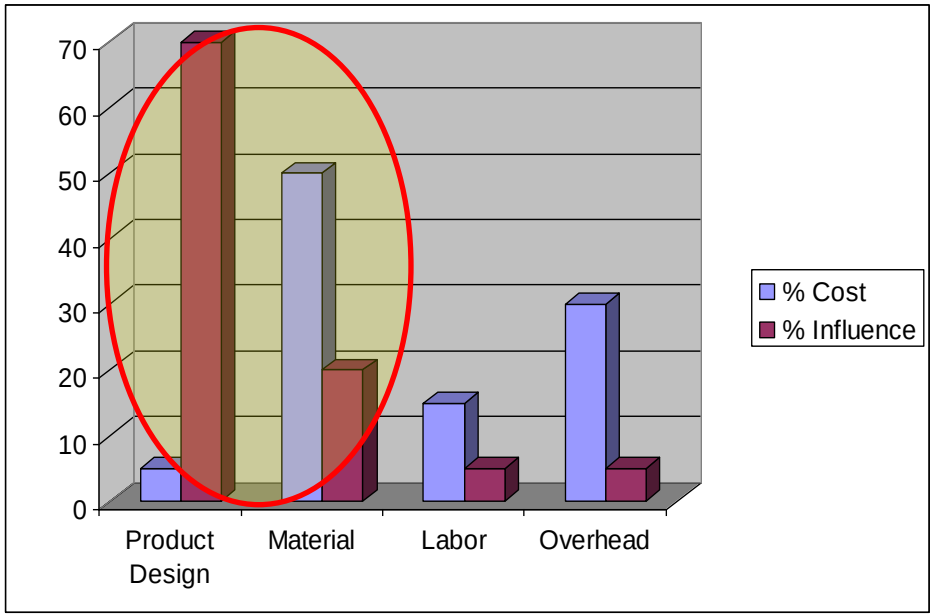

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Product Design

- 3D CAD Software

SolidWorks

Pro|ENGINEER® WILDFIRE® 4.0

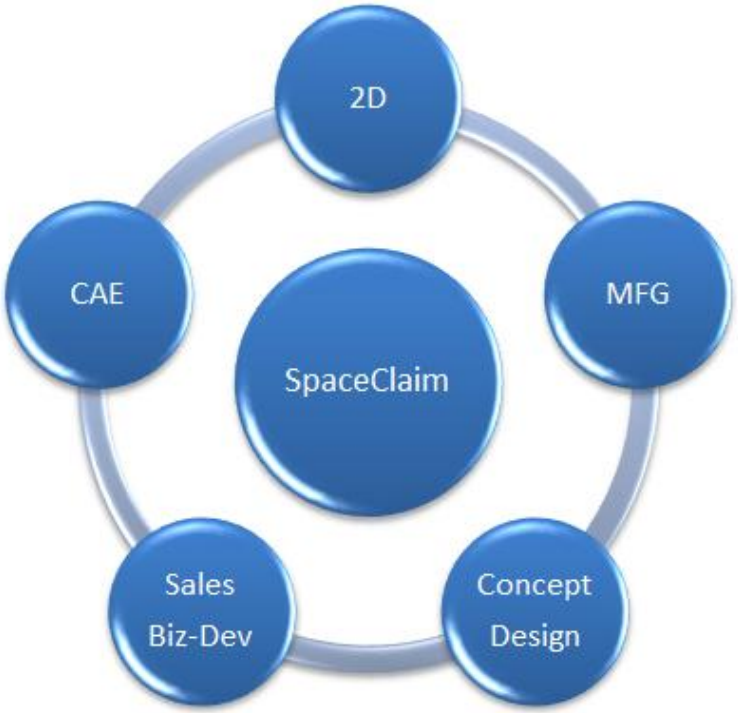
SPACECLAIM CORPORATION

Product Design

❖3D CAD Software – SpaceClaim

- Rapidly Create and Modify 3D Models

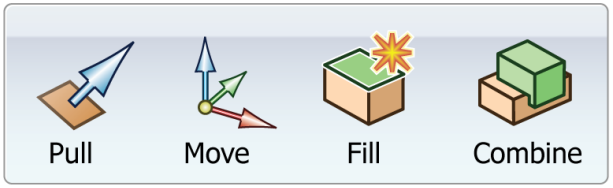
SpaceClaim enables:



- ❖ 2D Users
  - Faster and easier time to 3D
- ❖ Manufacturing Group
  - Faster time to finished part
- ❖ Concept Modeling Team
  - Faster time to concept designs
- ❖ Sales & Biz-Dev Engineers
  - Faster time to Bid & Higher Win Rates
- ❖ CAE Team
  - Faster time to Analysis

Product Design

❖3D CAD Software – SpaceClaim



Simple-Fast-Flexible

- **Streamlined User Interface: Simple**
- **Intuitive & predictive nature: Fast**
- **Direct Modeling technology: Flexible**

http://www.youtube.com/watch?v=36lxQw5mM_E

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Product Design

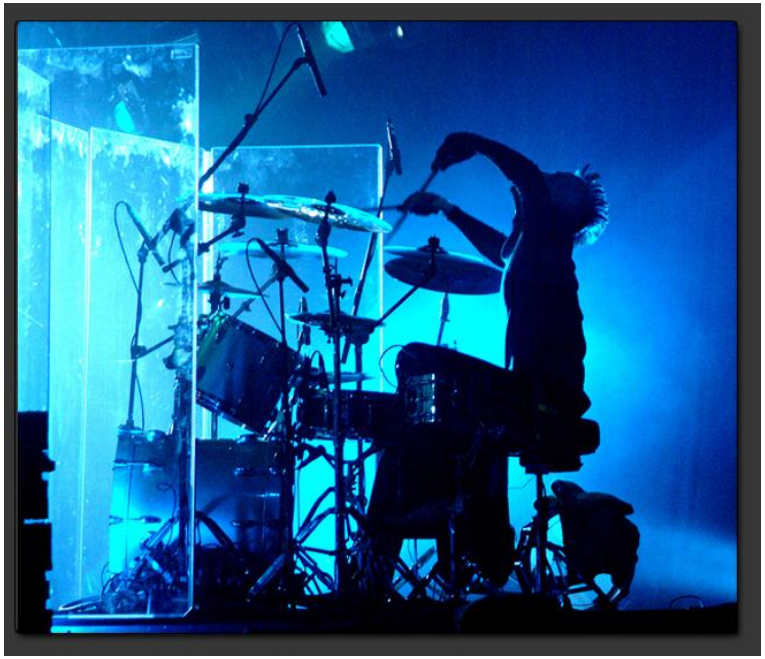
- SpaceClaim – Customers use
  - Manufacturing
    - Fixtures, tooling, process optimization
  - Design Engineering
    - 2D replacement, Brainstorming, Concept modeling
  - Bid Modeling
    - Real-time collaboration, 3D specifications, faster quotes
  - CAE
    - Model preparation, simplification and design optimization

Product Design

❖Sample Project

Innovation Heights

- High school drummer with an idea
- Had physical working prototype
- Drumstick holder
- keeping drumsticks in your hands
- Creating a product for manufacturing



Product Design

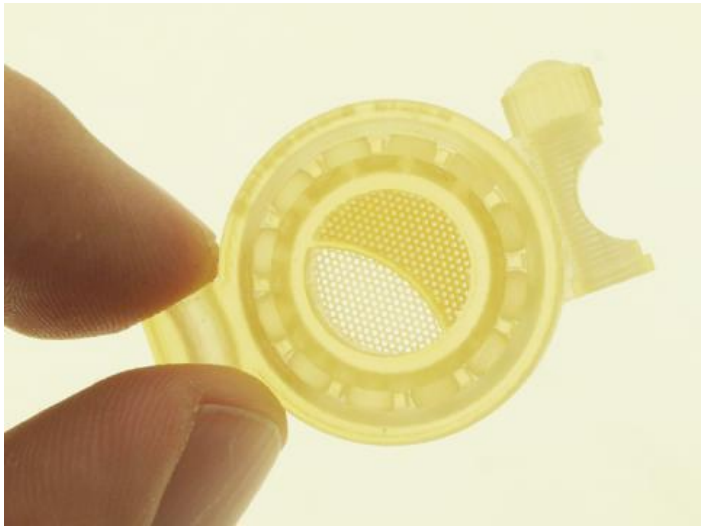
❖Sample Project

Drummer's Leash

- Research on bearings and fastening features
- Simple
- Ergonomic
- Aesthetically appealing
- 3D CAD for the manufacturer

Rapid Prototyping

- 3D Printing



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Rapid Prototyping

❖3DSYSTEMS - 3D Printing

Personal 3D Printers

Price: $1,300 - $25,000

Professional 3D Printers

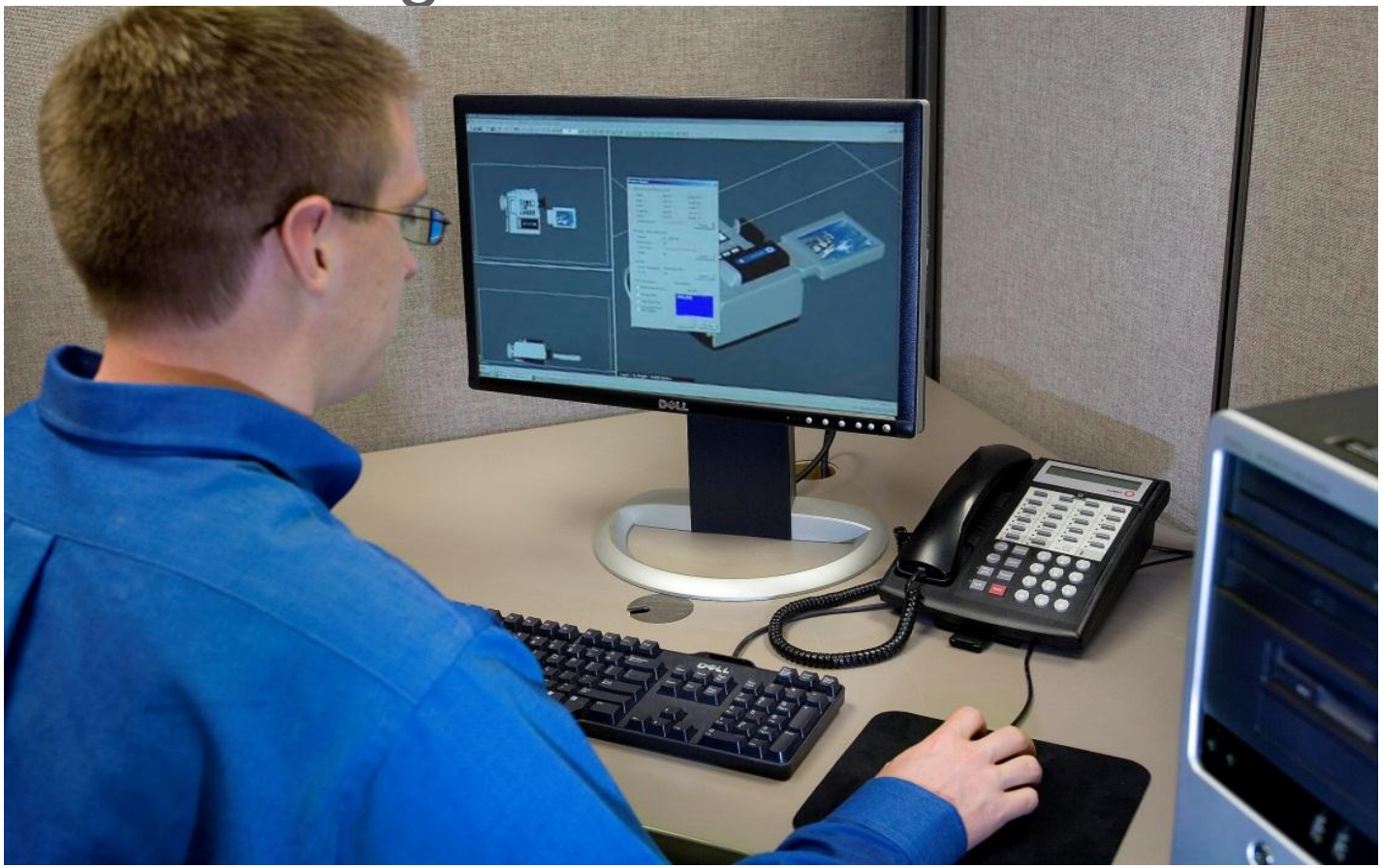
Price: $25,000 - $225,000

Lower price points

Higher performance

Rapid Prototyping

- 3D Printing – The Process

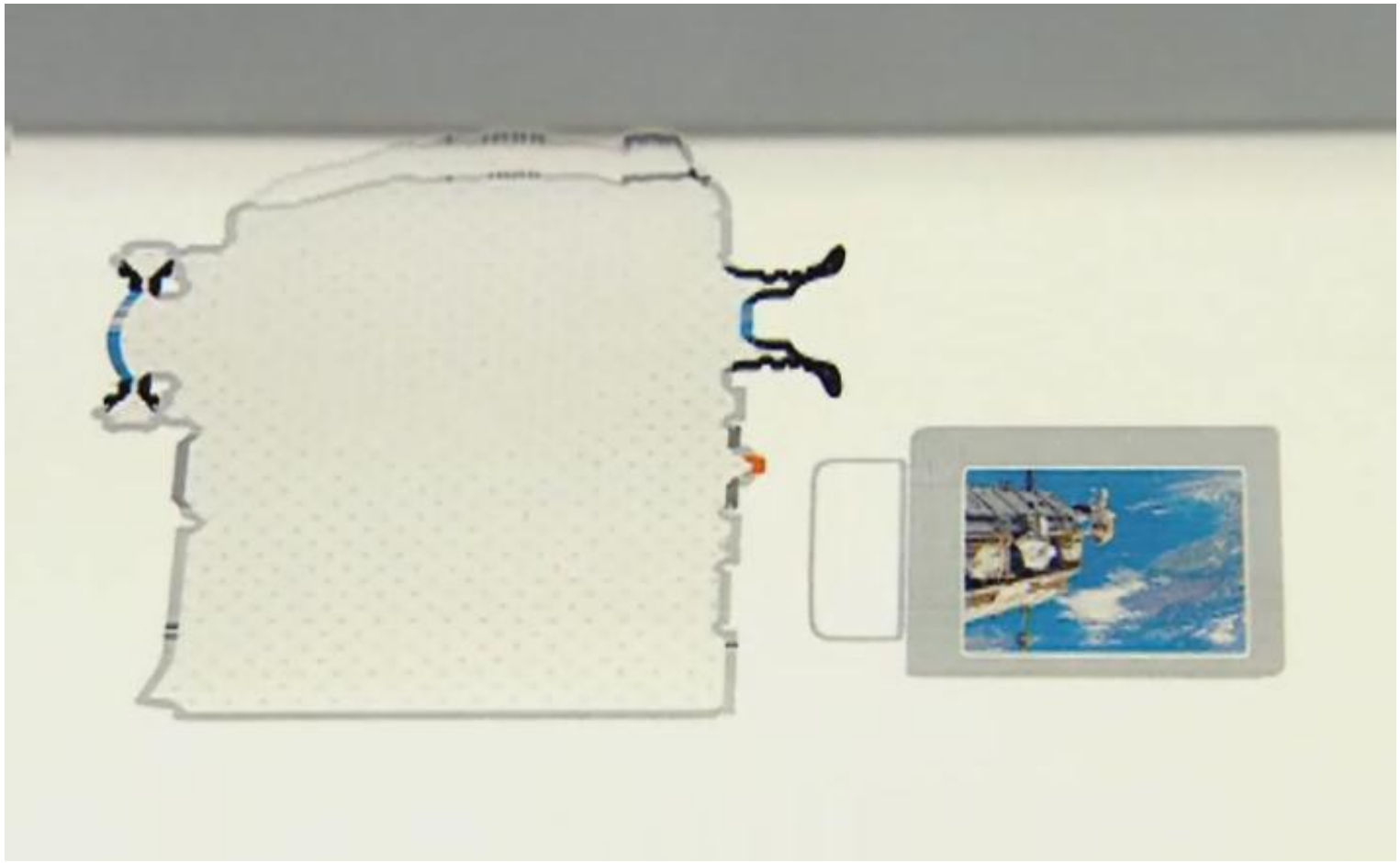


Export a CAD model

- STL, VRML, 3DS, PLY,

Rapid Prototyping

- 3D Printing – The Process



Print the Part – layer by layer

Rapid Prototyping

- 3D Printing – The Process

Empty & Recycle Powder - automatic

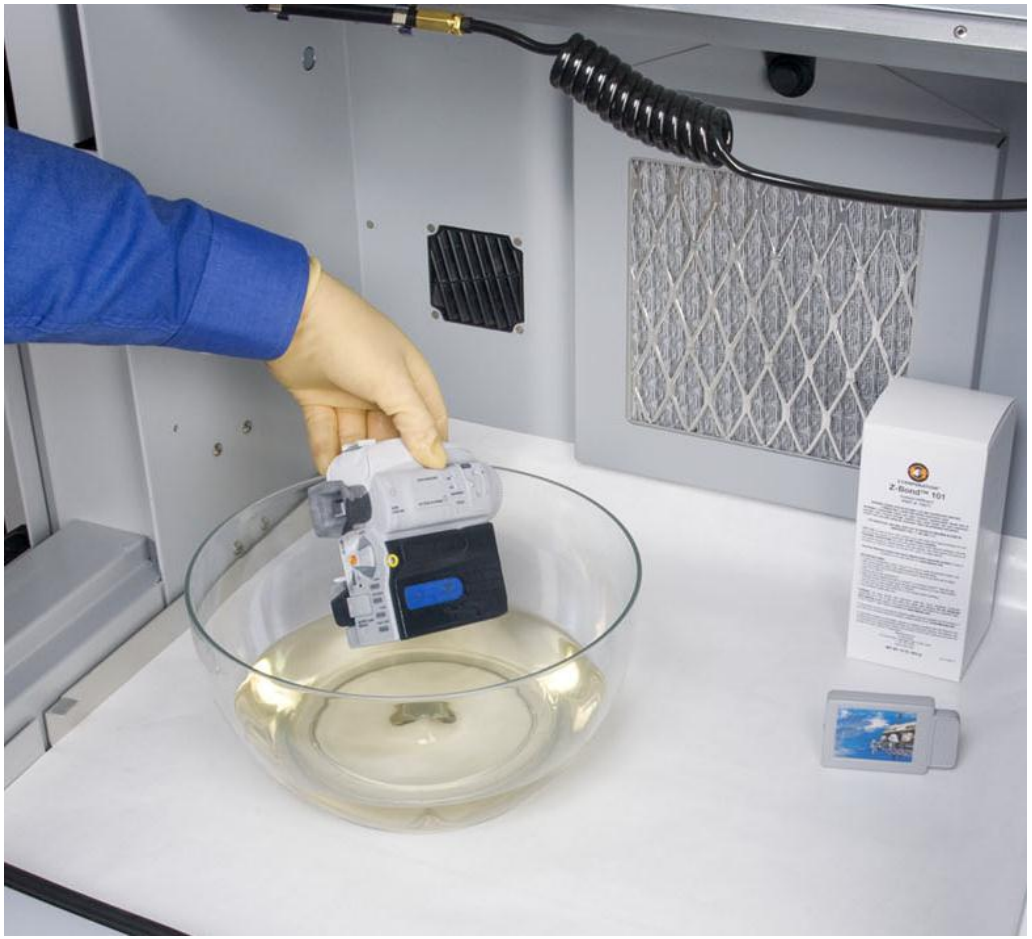
Rapid Prototyping

- 3D Printing – The Process

Depowder Part

Rapid Prototyping

- 3D Printing – The Process



Infiltrate part

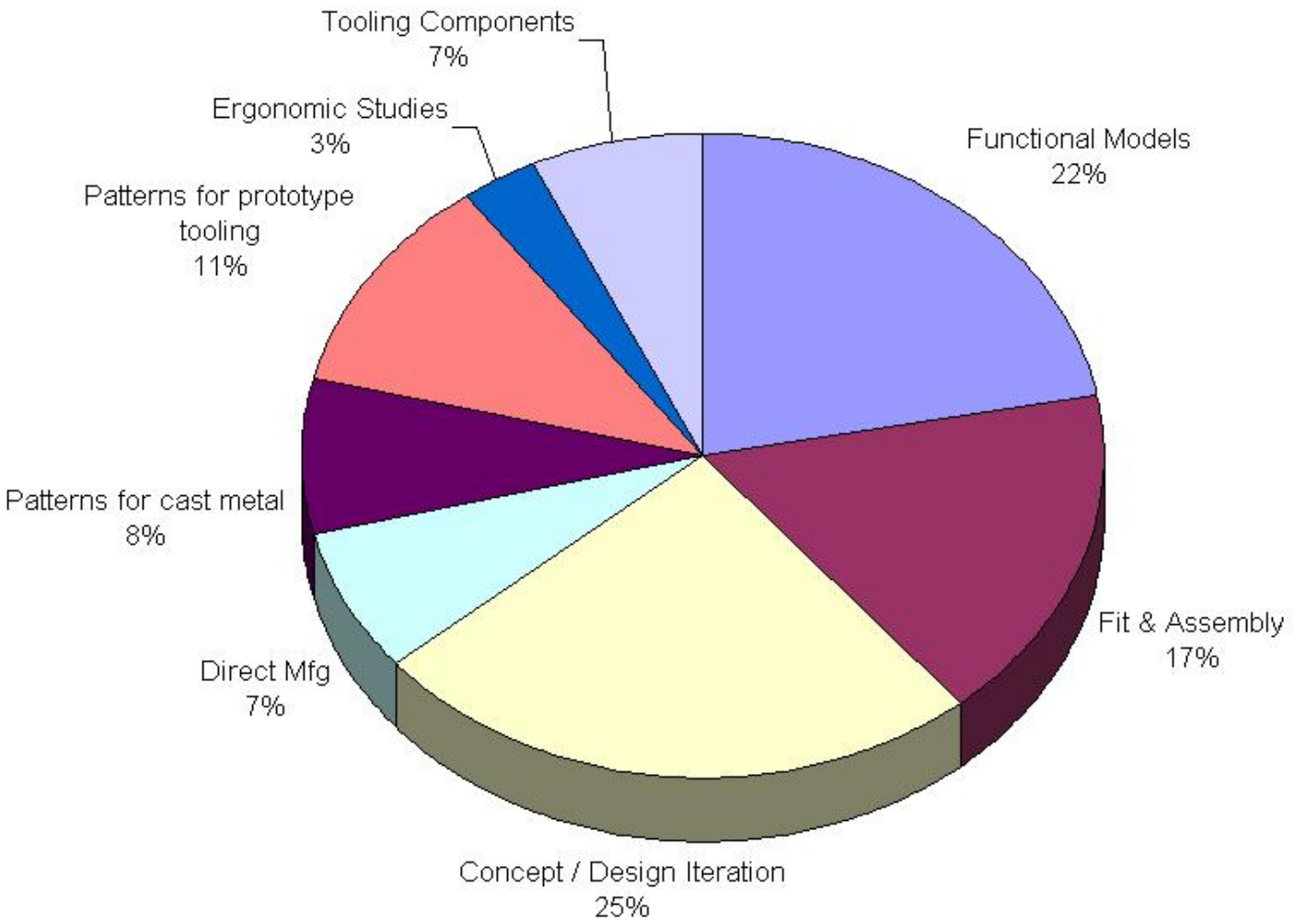
Rapid Prototyping

- 3D Printing – The Process

Finished Part

Rapid Prototyping

- 3D Printing Uses



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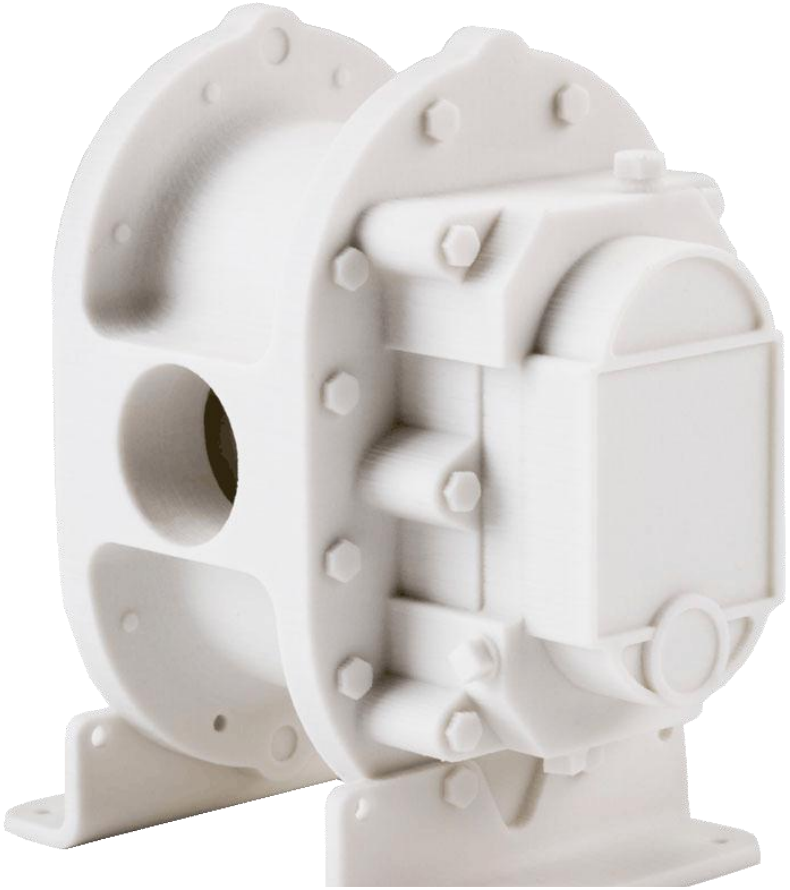
Rapid Prototyping

❖3D Printing Uses

- **Concept models**

Rapid Prototyping

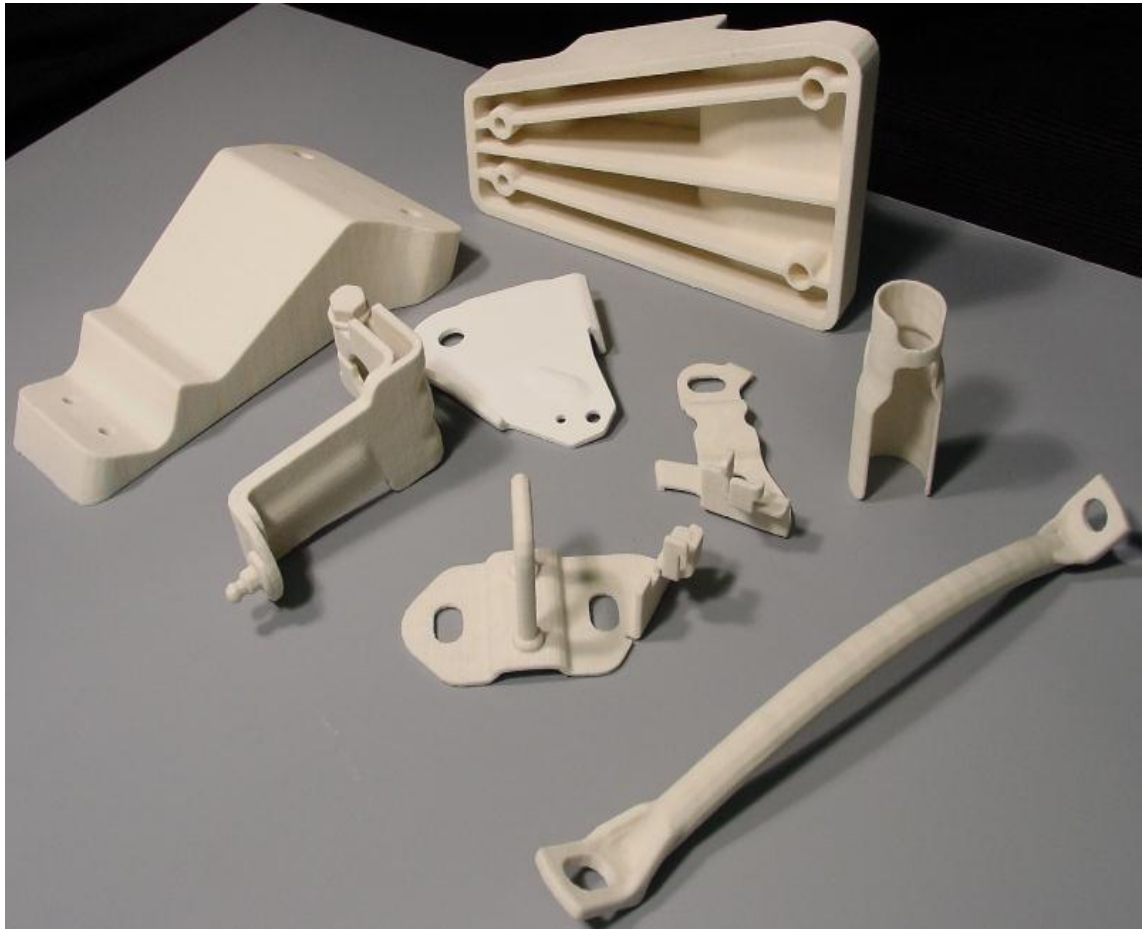
❖3D Printing Uses



- **Quotes & proposals**

Rapid Prototyping

❖3D Printing Uses



- **Manufacturing feasibility**

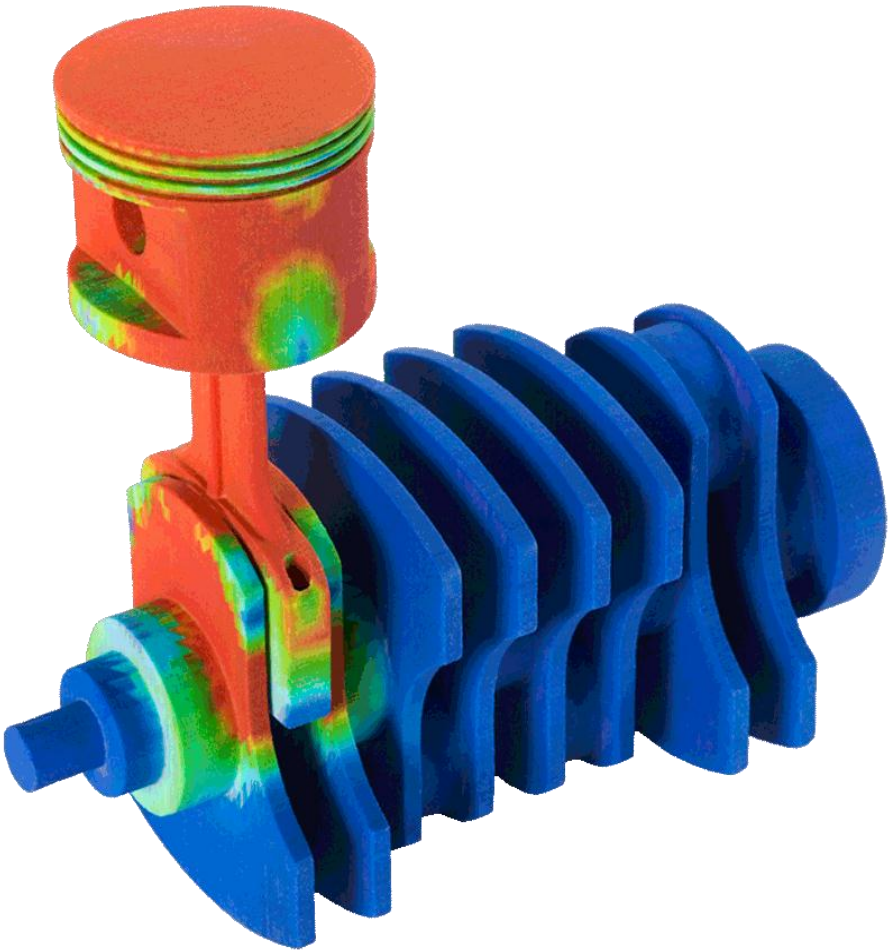
Rapid Prototyping

❖3D Printing Uses

- **Urethane molds**

Rapid Prototyping

❖3D Printing Uses



- **Analysis models**

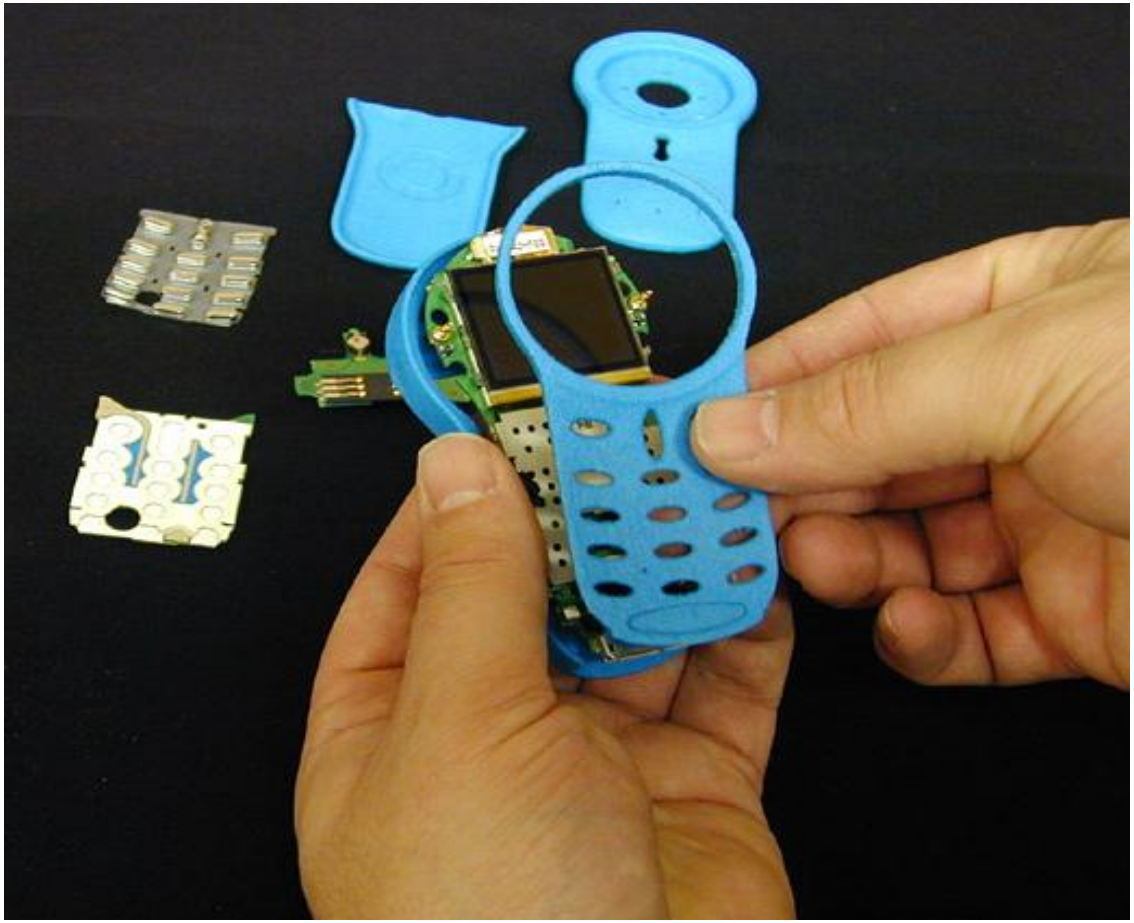
Rapid Prototyping

❖3D Printing Uses

- **Functional parts for testing**

Rapid Prototyping

- 3D Printing Uses



- **Assembly fit & feasibility**

Rapid Prototyping

❖3D Printing Uses

- **Architectural models**

Rapid Prototyping

❖3D Printing Uses

- **Direct tooling**

Rapid Prototyping

❖3D Printing Uses

- **Thermoform molds**

Rapid Prototyping

❖3D Printing Uses

- **GIS models**

Rapid Prototyping

❖3D Printing Uses

- **Ergonomic models**

Rapid Prototyping

- 3D Printing Uses

- **Packaging**

Rapid Prototyping

- 3D Printing Uses

- **Sales & marketing models**

Rapid Prototyping

❖3D Printing Uses

- **Appearance models**

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Rapid Prototyping

❖3D Printing – Broadest Range

Models	Prototypes	Form-Fit	Rapid Tooling	Molds	Casting Patterns

Accurate	Precise	Fine Details	Functional Materials	High Capacity	Economical

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Rapid Prototyping

- 3D Printing – Demo

http://www.youtube.com/watch?v=PgaurYNPWu8

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Review of Part I Objectives

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Additive manufacturing technology, that takes CAD files and slices up them up into, virtual horizontal cross-sections and then creates physical successive layers until the model is complete

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Objectives for Part II of Discussion

- Promising Practices for Educational Program Development in the Area of Rapid Prototyping
- Incorporating Additive Manufacturing as Part of a Engineering Technology Pathway
- Identification of Job Opportunities for Program Graduates

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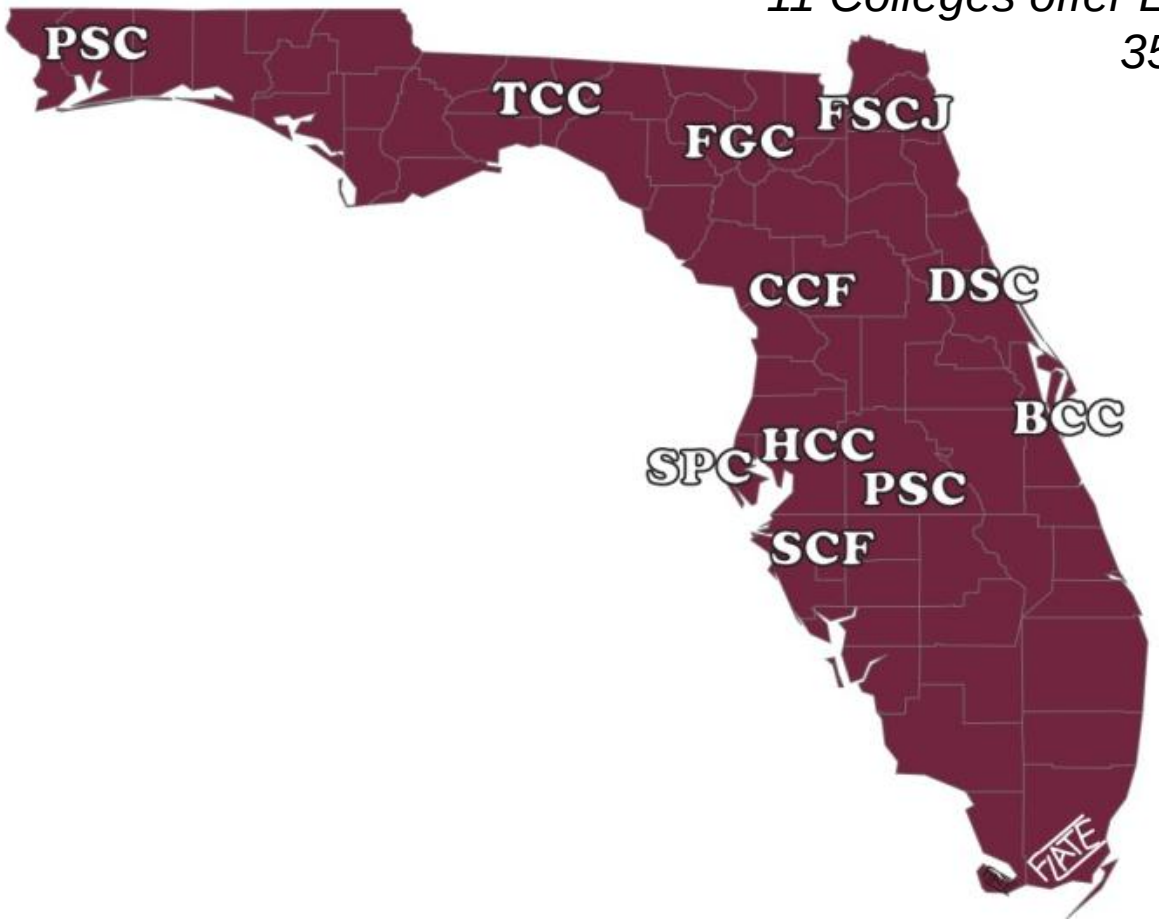
FLATE's ET College Network

11 Colleges offer ET Degree &
35 certificates



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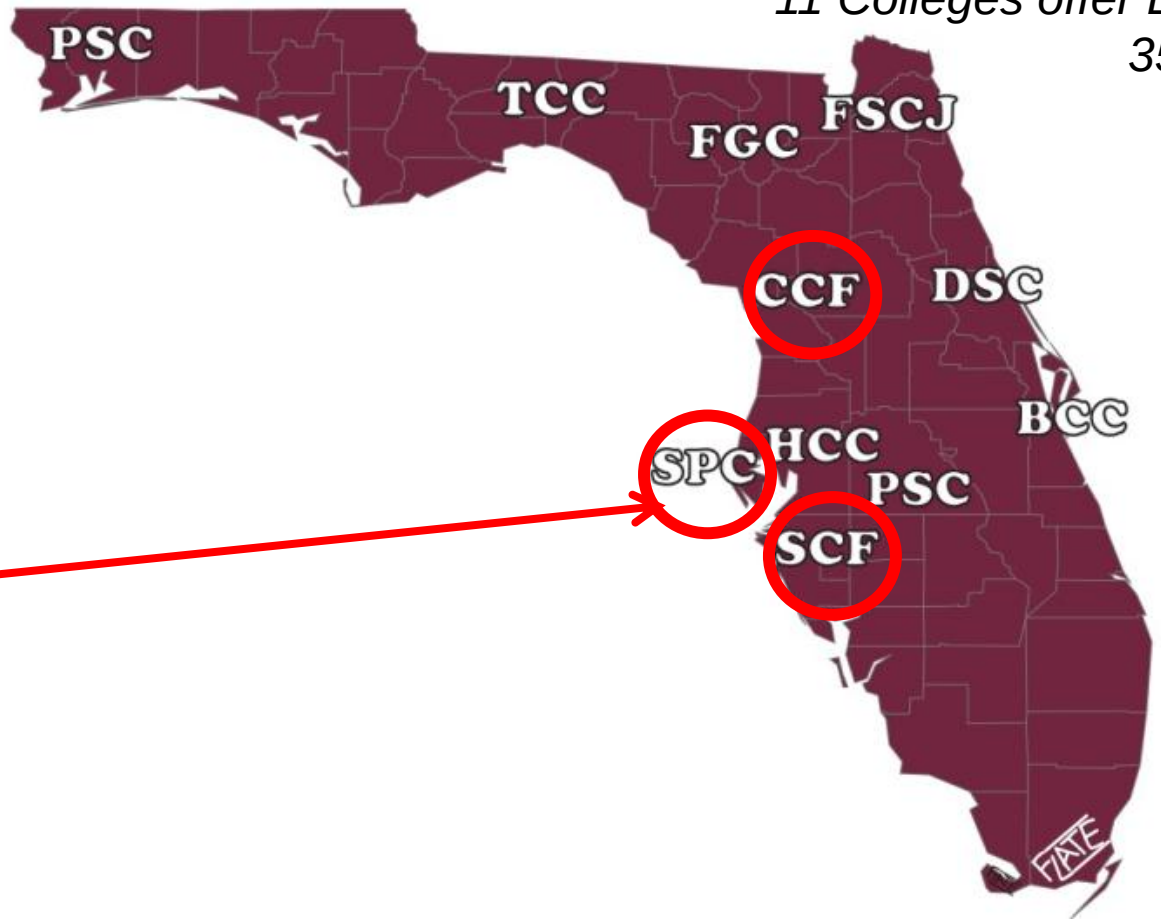

St. Petersburg College
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Florida's A.S. Engineering Technology Degree

60 semester hours

I. General Education – 15 - 18 credit hours

II. ET Core - 18 credit hours

III.8 Specialization Tracts – 24 to 27 credit hours

NETWORKS

Florida's A.S. Engineering Technology Degree

60 semester hours

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English
Math
Humanities
Science
Social Science

II. ET Core - 18 credit hours

Computer Aided Design
Manufacturing Processes & Materials
Mechanics & Instrumentation
Electronics
Quality
Safety

MANUFACTURING SKILL STANDARDS COUNCIL
MSSC
Tools for Workforce Excellence

III. 8 Specialization Tracts – 24 to 27 credit hours

Advanced Manufacturing
Biomedical Systems
Electronics
Quality
Advanced Technology
Digital Design & Modeling
Mechanical Design & Fabrication
Alternative Energy Systems

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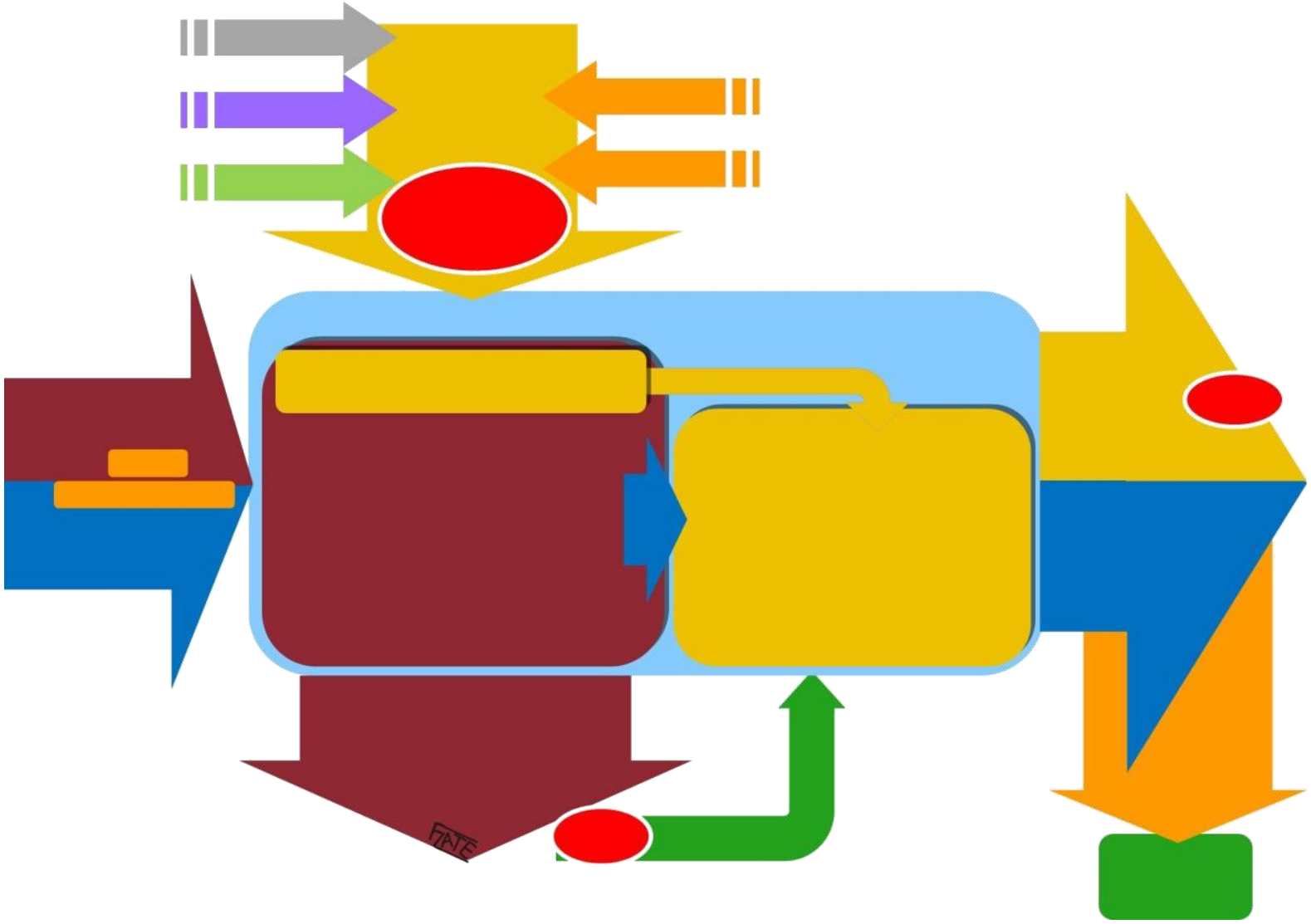
A.S. Degree Engineering Technology Pathways



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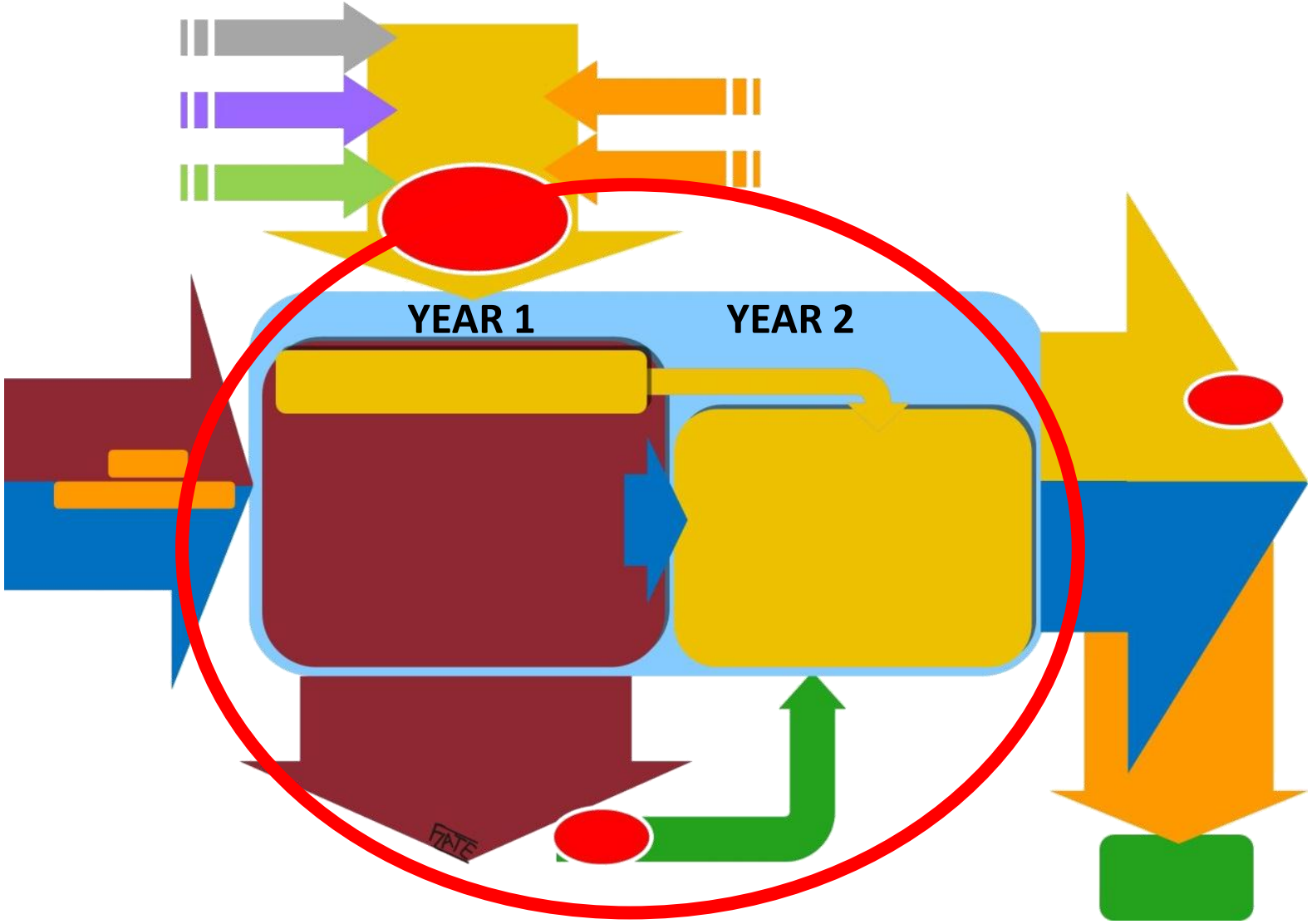
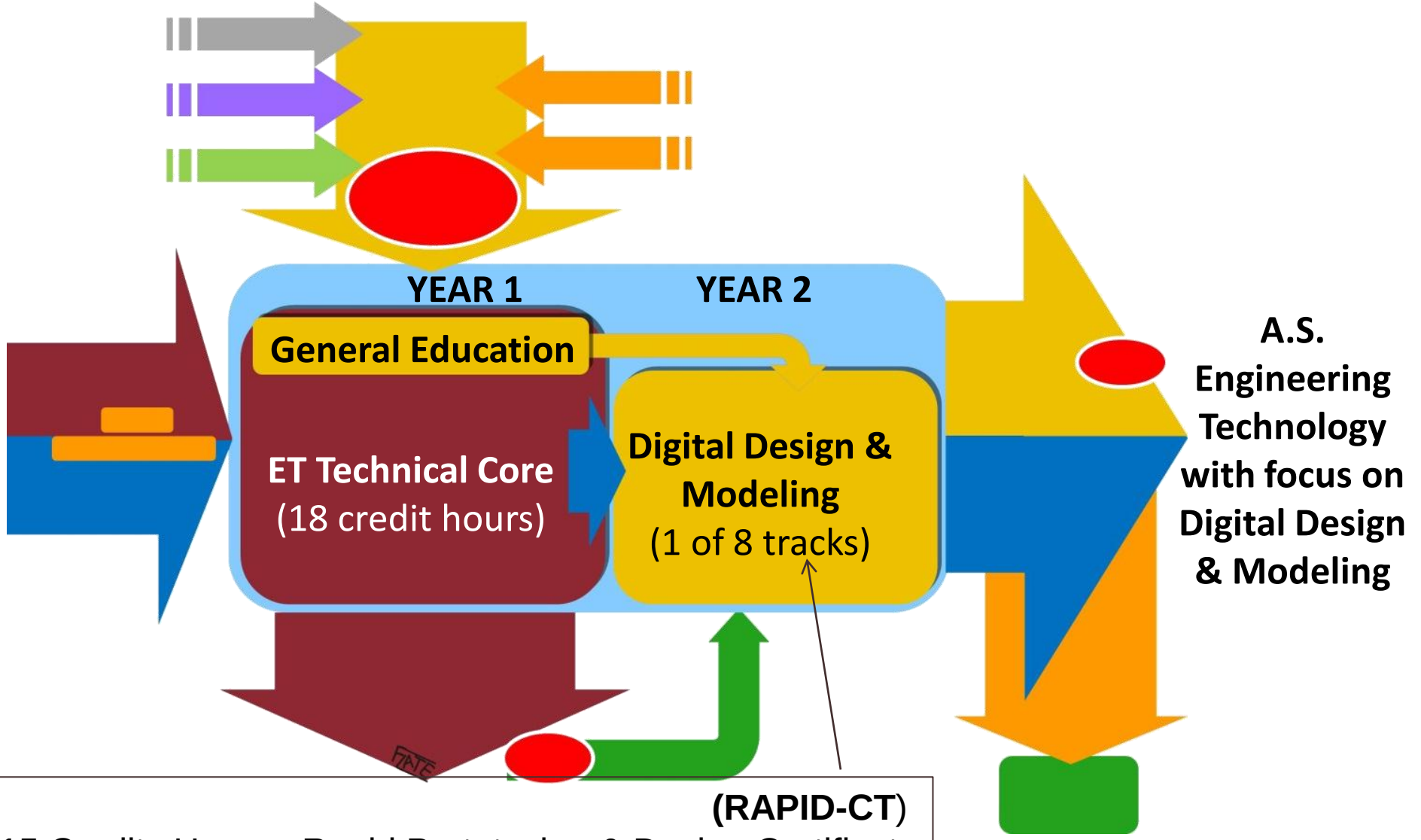
A.S. Degree Engineering Technology Pathways



A.S. Degree Engineering Technology Pathways



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St. Petersburg College SPC

A.S. Degree Technical Requirements (24 credit hours)

ETD 1340C	Autocad II	3
ETD 1350C	Autocad III 3-D modeling	3
ETD 2364C	Introduction to Solid Works	3
ETD 2368C	Advanced Solid Works	3
ETD 2369C	Solid Works Advanced Applications	3
EET 2949	CO-OP Work Experience	3
	Technical Electives	6

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St. Petersburg College

St. Petersburg College SPC

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St. Petersburg College

St. Petersburg College SPC

Rapid-CT Certificate Courses (15 credit hours)

ETD 2364C	Introduction to Solid Works	3
ETD 2368C	Advanced Solid Works	3
ETD 2369C	Solid Works Advanced Applications	3
ETD 2382C	Solid Works Simulation & Design Analysis	3
ETD 2371C	Rapid Prototyping: Model Design & Fabrication	3

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St. Petersburg College

St. Petersburg College
SPC

Job opportunities:

- CAD Designer
- CAD Technician
- Design Technician
- Rapid Prototype Designer

St. Petersburg College

St. Petersburg College SPC

Program Requirements

SOFTWARE	HARDWARE
Auto CAD	Dimension uPrint 3-D printer
Solid Works 2011/2012	Dimension Elite 3-D printer
CAMWorks 2D/3D Mill	Roland MDX-40 CNC machine
Master Cam	Dell T-3500 Computers
Modela	Laser Scanner (*Coming soon*!)

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COMPANIES HIRING	
DSE	*Tampa*
TSE	*Clearwater*
Jabil Circuits	*Clearwater*
Gun Barrel Drilling of Florida	*Clearwater*



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“Webinar Innovative Manufacturing”

Upcoming Webinars

March 23:	Minority Male Initiative: Keys to Success
April 13:	Earning Credentials
April 20:	Masters Series From STEM to STEAM: Importance of Arts in STEM

www.matecnetworks.org/growth.php

NETWORKS

Certificate of Participation

If you attended the live version of this webinar and would like a certificate of participation, please email

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Innovative Manufacturing