ID-1054 Digital Fabrication

** First 3D printed Lord Ganesha displayed at Bangalore Metro Station in India*

Course Instructor

Prasad S Onkar

Tutors

Shiva Ji and Srikar AVR

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Digital Fabrication

– what's this course about?

- Fabrication:
  - to make / Create an object
  - to give shape

- Digital:
  - Flexibility
  - Generic form of handling data

- *Digital Fabrication:* a generic way of converting an idea into a real object without necessarily having knowledge of manufacturing systems

About the course @IITH

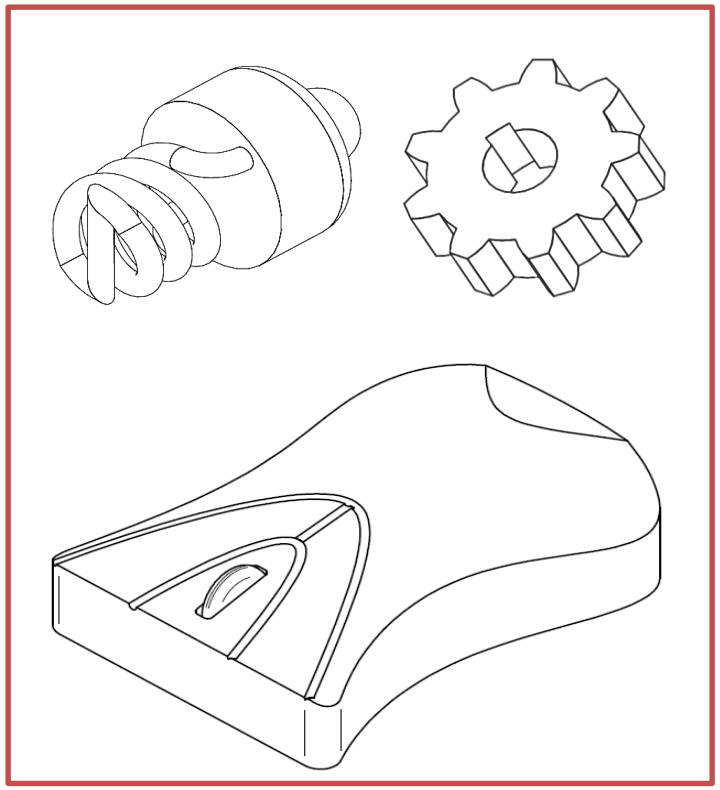
- Started in Aug 2014
- One of the unique courses to introduce advanced technology like 3D printing to B. Tech. 1st years
- First IIT to offer a course on 3D Printing at this level (1st year B. Tech.)

Organization of the Course

- **Part – 1**
  - Art to CAD
  - Training in using CAD software
  - **SolidEdge** - but basics across all CAD software same
  - Weekly tutorial sessions
- **Part – 2**
  - CAD to Real part
  - In project mode – each student/team to conceptualize and design a 3D printable product.

What you will learn in this course?

How to Create 3D models → How to process 3D models for 3D Printing → How to print the Objects



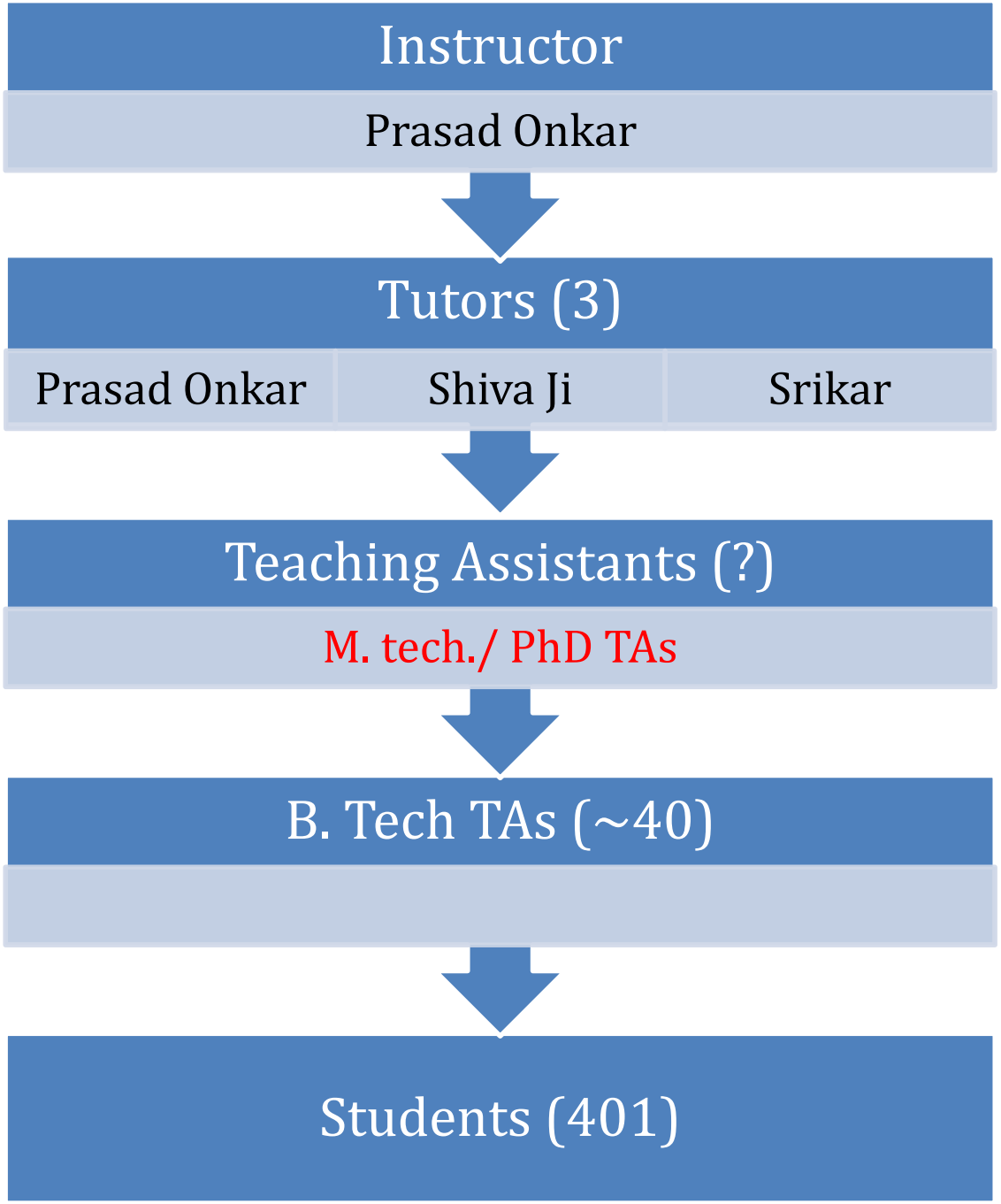
Class timings

Common Theory Class	All		Wednesdays (4:30-5:30)
Tutorial	(CE+ME)	**EP+MA**	AN1 Mondays (2:30 to 4:30)
Tutorial	(CS+BM+ES)	**MS**	AN4 Thursdays (2:30 to 4:30)
Tutorial	(AI+CH+BDES)	**EE**	AN3 Wednesdays (2:30 to 4:30)

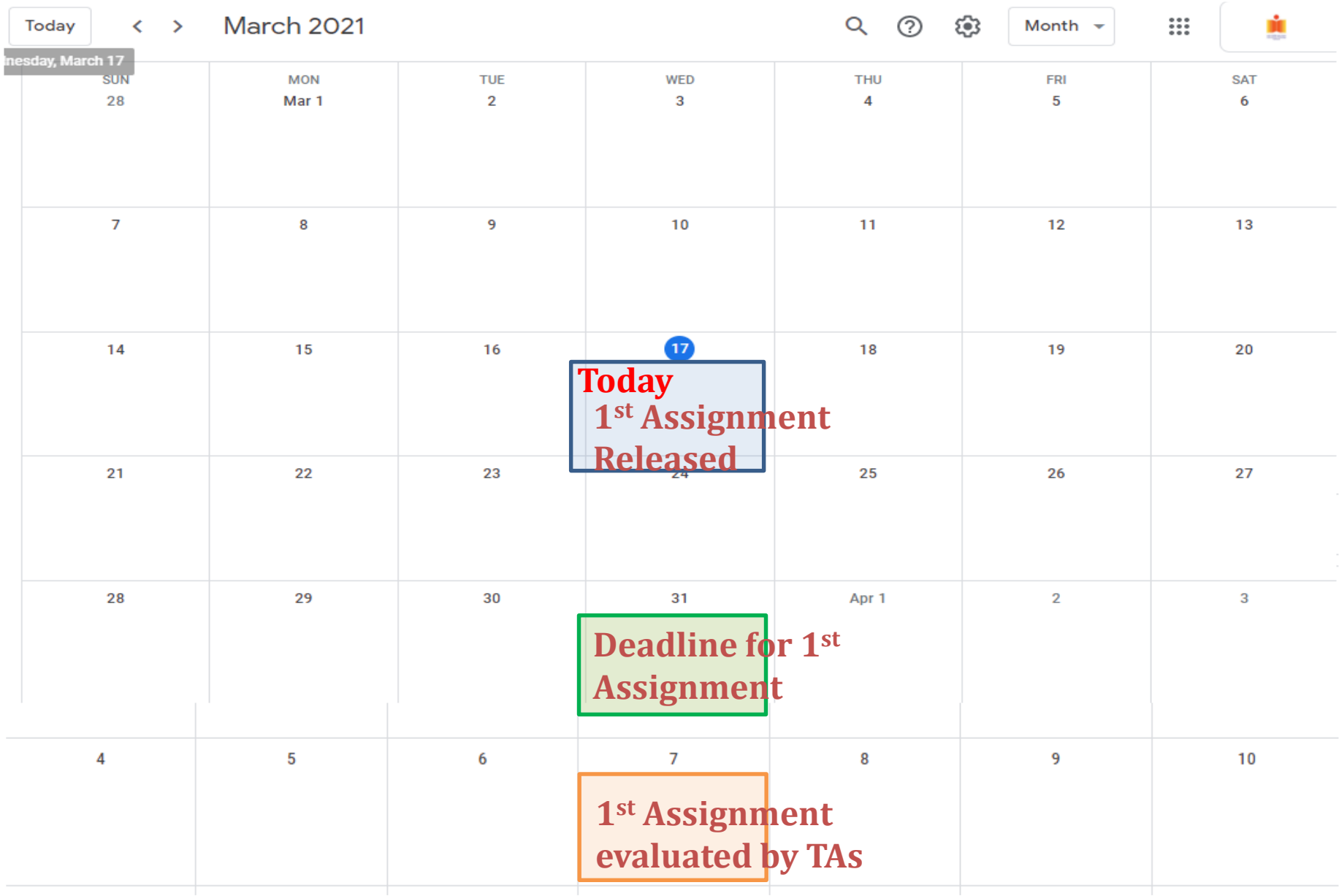
- All the classes will be conducted using Cisco Webex meet
- If you are here in the meeting means you have received the link for the class
- Each tutorial group will receive a separate tutorial link

- TAs
  - Your first Point-of-Contact for the course
  - Involved in helping you learn the software
  - Grade the assignments
  - Assist optimizing your for 3D Printing during the project phase
  - Individual TA allotment will be shared in the Classroom by tomorrow

- Tutors
  - The next Point-of-contact
  - Overall coordination
  - Project ideas
  - Project evaluation



Assignment Timelines (e.g. Assignment 1)



The Software

- Solid edge free download:
  - https://www.plm.automation.siemens.com/plmapp/education/solid-edge/en_us/free-software/student

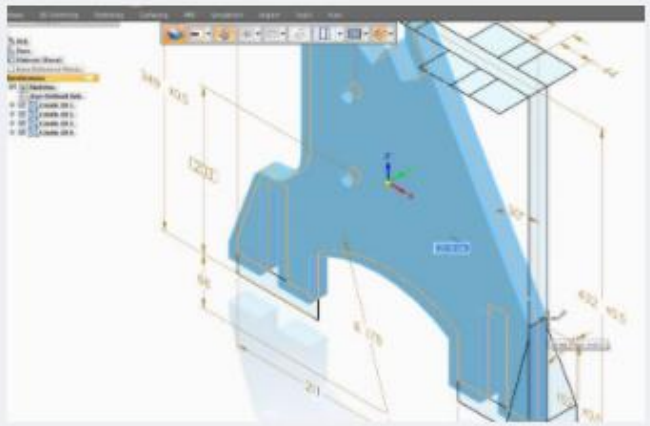
Solid Edge Student Edition

Free professional 3D CAD software for students

Engineering is an exciting, challenging and rewarding discipline that offers opportunities in a diverse range of careers. You can build the skills you need with Solid Edge Student Edition software—a free version of the same easy-to-use software suite used by professionals. Learning Solid Edge as part of your education prepares you to enter the workforce and helps you stand out in today's highly competitive economy.

This free download:

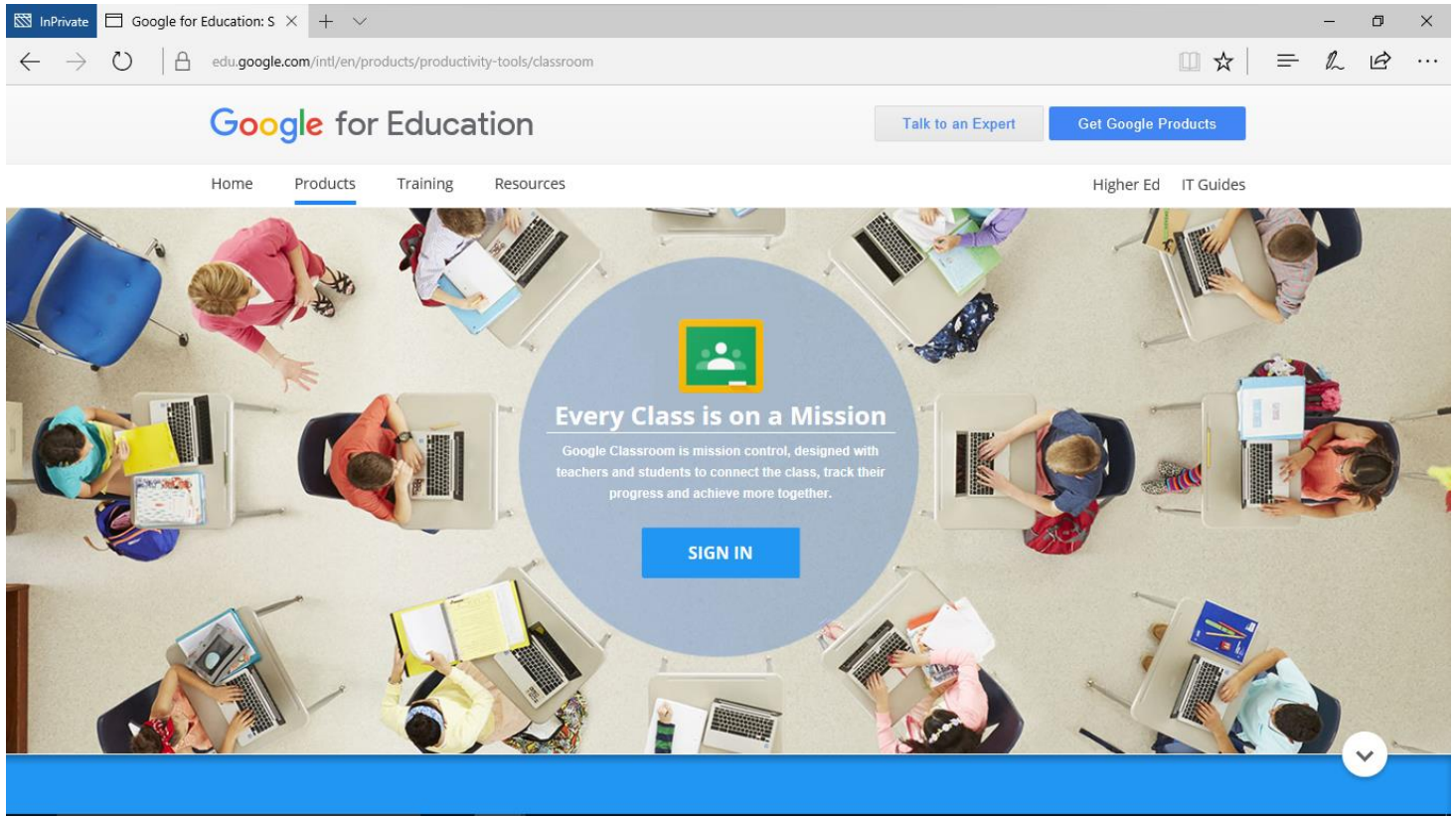
- Is available to any active student
- Is intended for academic course work
- Has a license that will not expire



Note: Files created in this edition cannot be opened in commercial versions of Solid Edge and 2D drawings are watermarked.

Course Material and Assignment Submission

- Through Google classroom
- http://classroom.google.com



How to join the Google Classroom?

- You will be sent a request to join the class, accept it by clicking on ‘join’

In case if you don’t receive the request mail, follow the following steps:

- Go to http://classroom.google.com
- Login with your IITH Gmail account credentials
- Click on the ‘ + ’ symbol to join the class
- Enter the class code **nxziwgt** and click ‘join’

Let’s Begin

Conventional Manufacturing Processes

Turning (Lathe)

Milling

Drilling

These are typical material Removal processes (Subtractive Manufacturing)

Additive Manufacturing
3D Printing
Rapid Prototyping

Introduction

- Rapid - How to make things faster?
- The goal is to speed up the design, evaluation and manufacturing cycles.
- Detailed planning is the bottleneck to speed. Therefore, eliminate or at least minimize it through automation.
- Also referred as Additive Manufacturing and Rapid Prototyping

Lithography

Old method:

- Mirrored letters assembled in a block.
- Limited choice of fonts, styles and sizes; restricted graphics (no color or photograph)

New method:

- Choose any 2D matter including color photographs and create it virtually in the computer.
- No assembly. Printing occurs in total automation.

ABCDEFGHIJKLM

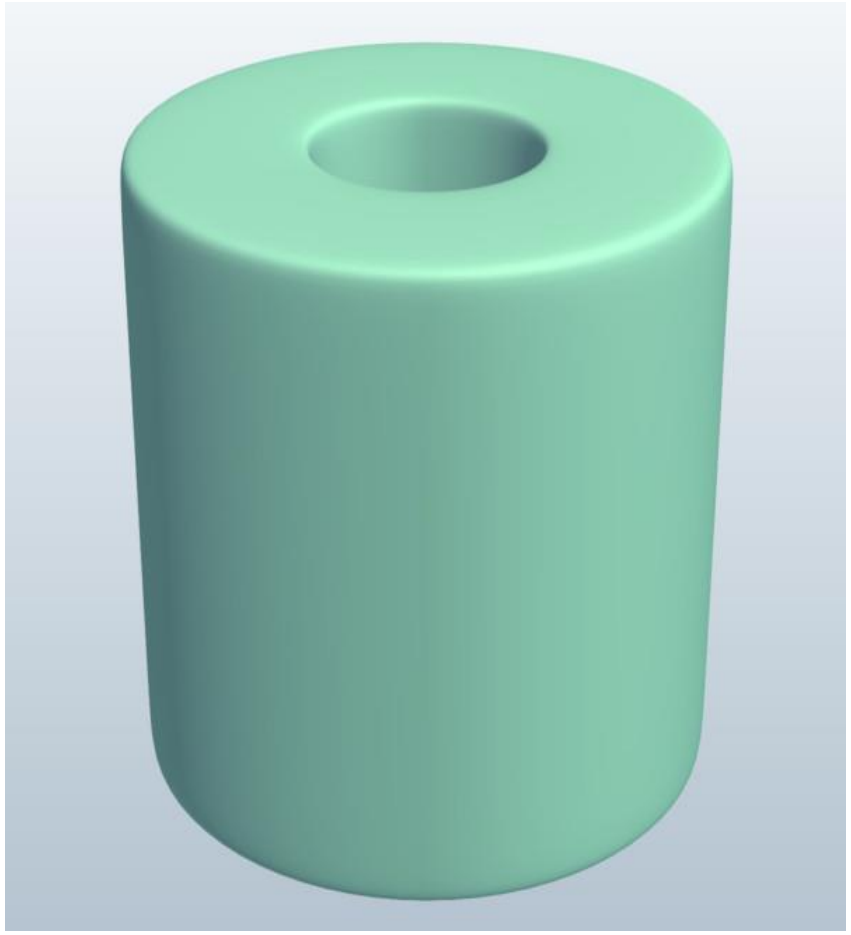
NOPQRSTUVWXYZ

Basic Principle of AM

Look at a shape as a not as an single object, but as a sum total of repetitive elements

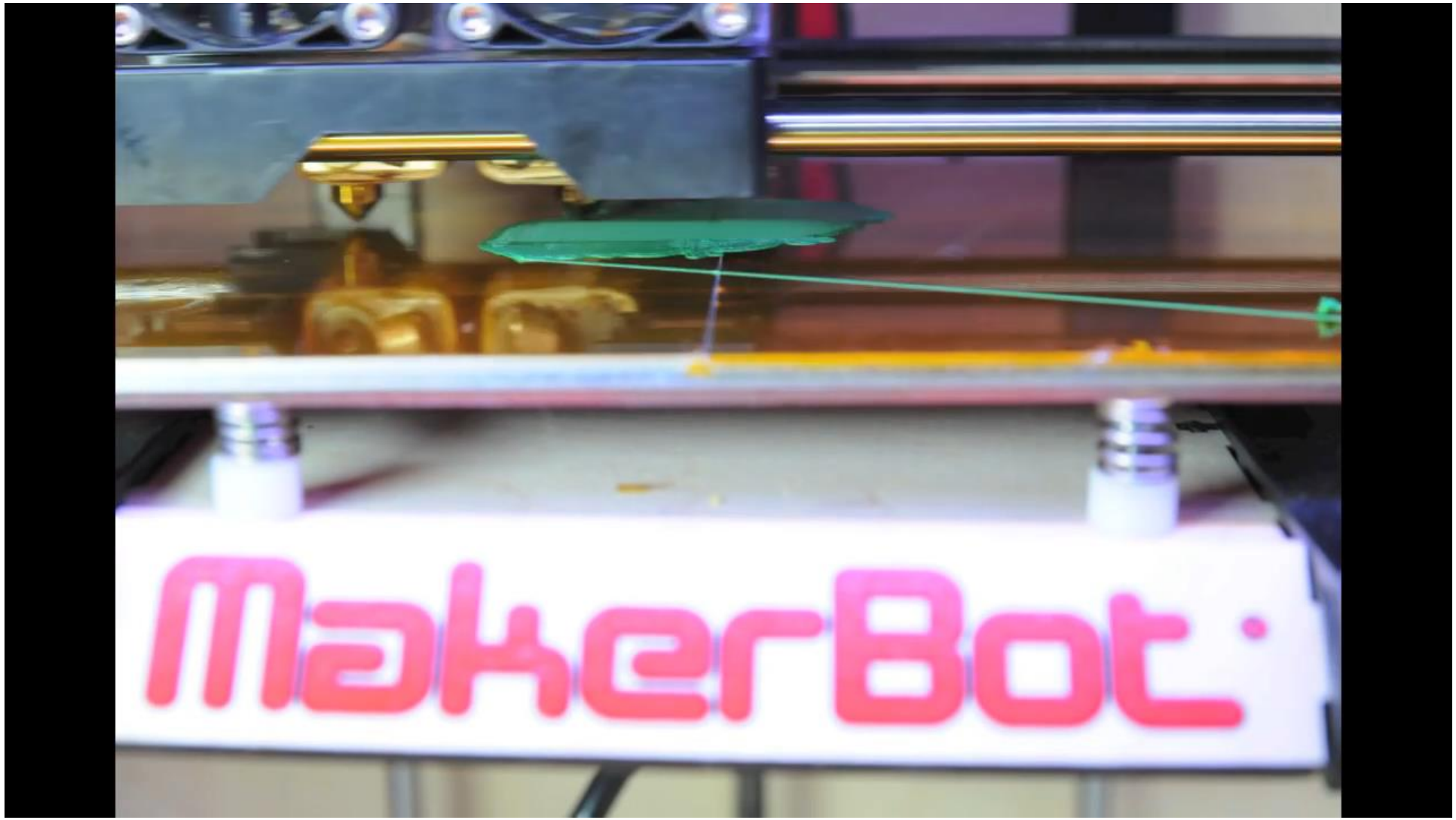
How does it work?

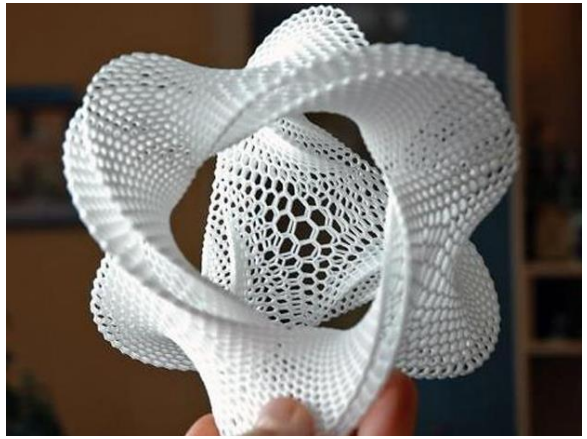
Basic Principle of AM

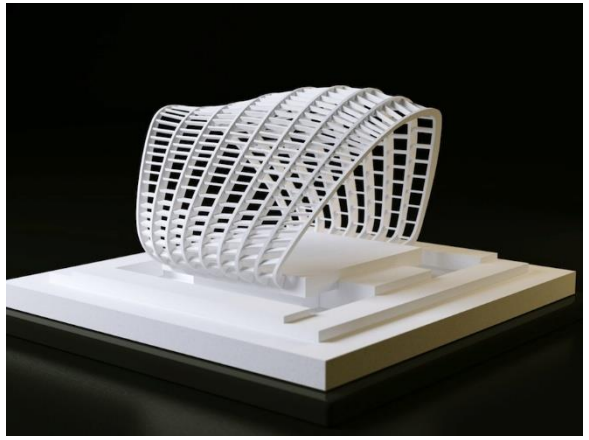


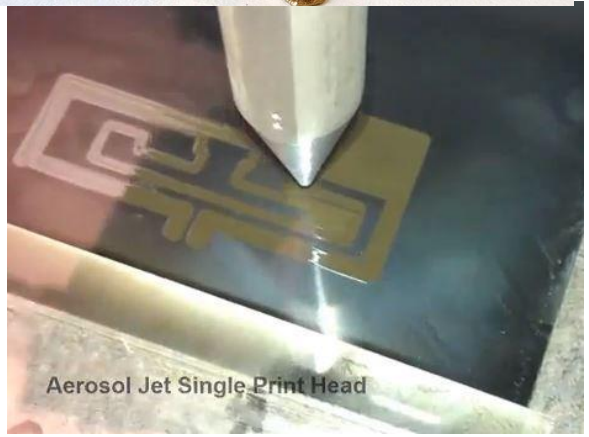
You may visualize the process like this…

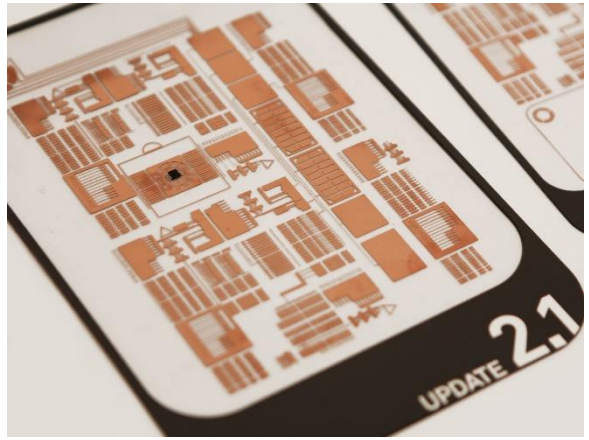
Sounds familiar?


MakerBot






Aerosol Jet Single Print Head


UPDATE 2.1

Questions….?