How to CAD almost anything!
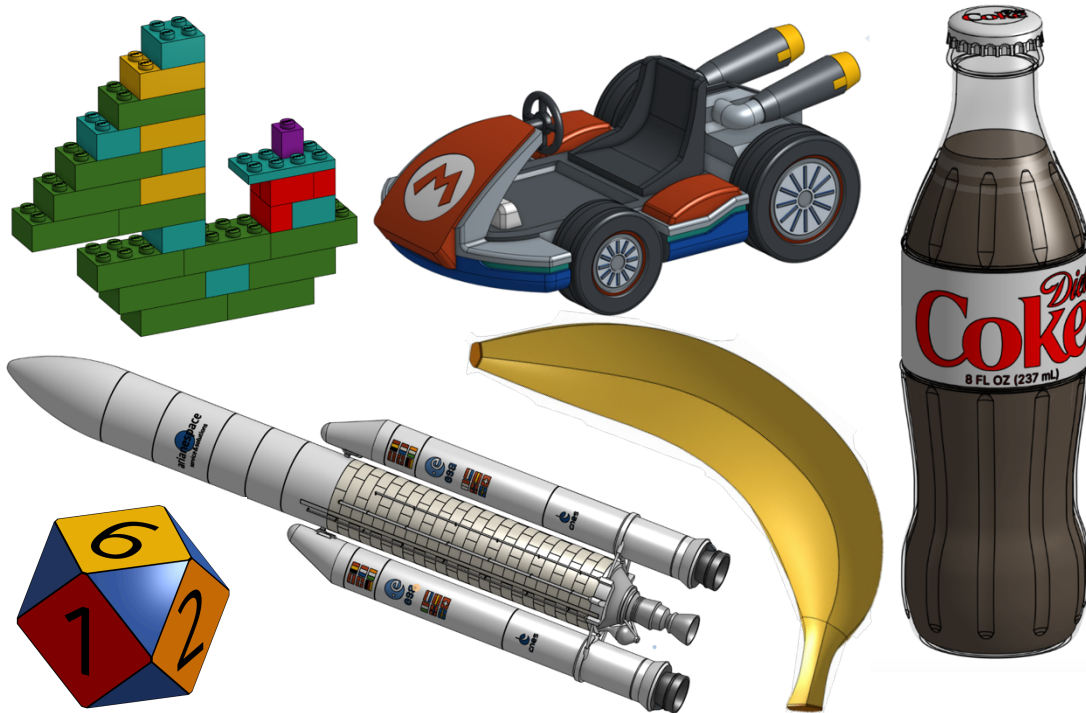IAP 2025 – AeroAstro Workshop

A compressed yet rewarding introduction to the parametric design software Siemens NX, for beginners (no experience at all) and pro-users alike. Come learn how to CAD

(computer-aided design) essentially almost anything!

Yes, this could be YOU at the end of the workshop! You'll be equipped with the tools to design cool looking things such as a LEGO boat, a Mario Kart, a bottle of Coke, a banana, an Arianne V rocket, and even a 12-sided dice!

Workshop Details

Subject Title:	How to CAD almost anything!
Prerequisites:	Willingness to have fun and think outside the box!
Enrollment:	20.
Attendance:	Participants must attend all sessions.
Meeting Room:	GIS & Data Lab (located on the first floor of the Rotch Library, 7-238).
Meeting Times:	Tuesdays and Thursdays 10am – 12pm. There are a total of 6 weekly sessions, starting on 01/07/24 until 01/23/24. The sessions will take place on 01/07, 01/09, 01/14, 01/16, 01/21 and 01/23.

Instructor: Andy Eskenazi - AeroAstro PhD student (LAE), andyeske@mit.edu.

About: Hailing from the capital of Tango, Steak and Football, Andy is currently a PhD student at MIT AeroAstro trying to make aviation more sustainable. Outside of research, he is passionate about all things mechanical design. Previously, at the University of Pennsylvania, Andy TAed "MEAM 101: Introduction to Mechanical Design" for 6 semesters, where he estimates having taught, directly or indirectly, approximately 300 students. Additionally, he has taught the "How to CAD Almost Anything!" series three times, for Solidworks, Fusion 360 and Onshape.

Workshop Description

Ever wondered how are objects from our daily lives designed? How can we generate a computer 3D model of a mug, a bottle of Diet Coke, or a Saturn V rocket? What about designing the blades of a jet-engine? A test dummy? How about making an animation of a LEGO house building itself? Or making a realistic render of a bowl of fruit? In this AeroAstro workshop, you will learn the skills to design all of these, and much more!

Split into 6 2-hour long sessions, the first half of each session will be spent learning new Siemens NX skills, while the second half will see the application of these news skills through in-class activities, with a focus on reverse engineering. In contrast to traditional mechanical design courses, this workshop places greater emphasis on the design process itself, understanding how we can plan and best leverage our available tools to arrive to our desired result. Thus, the sessions are less about following the instructions on an engineering drawing, but about independent thinking and strategizing, reverse engineering an object into a 3D model.

Workshop Schedule

#	Month	Day	Date	Outline and Objectives
1	Jan	T	01/07	**Session 1**: Introduction to Onshape. Objective: In this session, we'll get ourselves acquainted with the Siemens NX workspace, and start learning some of the most used tools. S1's goals include: • Creating sketches (using basic shapes, construction lines, smart-dimensioning, sketch relationships) and understanding planes. • Understanding what it means for a sketch to be fully defined. • Locating and using the different elementary feature commands (boss extrude, boss cut, fillet, chamfer). • Editing sketches and features after creating them. • Coloring parts and changing material properties. Session activity: Using the tools learned on S1, we'll design a variety of items, including: • A standard six-sided dice • A Nokia 8210 phone.

2	Jan	Th	01/09	**Session 2**: Splines, Sketch Pictures and logos! Objective: In this session, we'll continue exploring some of the most powerful Siemens tools. S2's goals include: • Learning how to use the spline tool. • Learning how to add a picture and sketch on it. Session activity: Using the tools learned on S2, we'll design a variety of items, including: • An MIT angry beaver banner. • A keychain of your favorite airline.
3	Jan	T	01/14	**Session 3**: All about symmetry, patterns and planes! Objective: In this session, we'll focus our attention to symmetry, patterns and planes, and how we can leverage certain tools to simplify the design process. S3's goals include: • Understanding how to create a sketch for a revolve. • Learning how to make use of the mirroring and circular patterns tools, both as a sketch and as a feature. • Learning how to create planes, at different angles. Session activity: Using the tools learned on S3, we'll design a variety of items, including: • A fidget spinner! • A Chinese pagoda.
4	Jan	Th	01/16	**Session 4**: Sweeping through the courts! Objective: In this session, we'll explore two very powerful Siemens NX tools, loft and sweep. These tools allow us to create complicated looking geometries, like the body of a 747 or the surface of an apple. S4's goals include: • Learning how to use the lofting and sweep command. • Continuing to master previously explored tools, such as revolve, linear/circular patterns and plane creation. Session activity: Using the tools learned on S4, we'll design a variety of items, including: • A head paddle tennis racket. • A banana, in honor of the banana lounge (using various plane cuts, splines and lofts).
4.5	Jan	Sat	01/18	**BONUS**: Let's have a 3D-modeled Coke in Space!

				Objective: In this session, we'll revise our previously learned commands (+ the useful wrap), to make sure we know how to properly use all of them. S4.5's goals include: - Revising some of the previously learned commands, including loft, revolve, sweep, plane creations, patterns, filleting, and material properties. - Learning how to employ the wrap command (for engravings). Session activity: Using the tools learned on S4.5, we'll design a variety of items, including: - A Diet Coke 222ml can (with labels included). - An MIT tech dinghy sailboat.
5	Jan	T	01/21	**Session 5**: Living in a world made from plastic bricks! Objective: In this session, we'll move towards one of the most powerful features within CAD parametric softwares, which is that of making assemblies! S5's goals include: - Learning how to make an assembly of multiple parts. - Learning how to make an exploded view of an assembly and subsequentially animating it. - Learning how to create an engineering drawing of a part and assembly (including exploded views). Session activity: Using the tools learned on S5, we'll design a variety of items, including: - A standard 2x4 LEGO block (as well as 2x3, 2x1 and slanted 2x2 and 2x3). - A standard 2x8 LEGO plate (as well as 2x6) - A simple LEGO airplane assembly. - An engineering drawing of the airplane assembly and one of the LEGO bricks.
6	Jan	Th	01/23	**Session 6**: Variable Tables and Equations! Objective: In this session, we'll investigate two often underappreciated yet extremely useful tools, variable tables and equations. These tools allow the user to create various configurations of the same model, depending on specific needs. S6's goals include: - Changing names of sketches and features under the feature tree. - Learning how to create equations and incorporate them into a design table. - Creating configurations of the same model. Session activity: Using the tools learned on S6, we'll design: - A wooden toy train with tracks! (different configurations for the track lengths and trains).