

Fall 2018

ID 216-101: Modeling and Prototyping

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ID 216 - Modeling and Prototyping
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Course Overview:

ID216 Modeling and Prototyping is the first in a series of two classes for second year Industrial Design students. Both fall into the category of “skill classes”. While a measure of inventiveness and creativity are expected from students, the objective of this class is mastery of the skills we cover. ModPro will introduce students to the fundamentals of computer modeling with emphasis on a workflow that is conducive to revision and refinement. The physical modeling portion of the class will focus on techniques students can use to explore and refine form during development, as well as methods and materials for preparing presentation models.

Homework load will be around 3 hours per week for an average student. It is not uncommon for some students to spend extra time on homework in the early weeks of the semester. Investing this extra time at the outset is a prudent course, as this class is the foundation of a career-long learning process.

A Word About 3D CAD:

Computer aided design is rooted in the drafting table, straight edge, and spline weights of our progenitors; tools whose mastery required devoted study and practice. In my time as a designer I have both witnessed and experienced “3D CAD Paralysis”. This crippling obstacle arises whenever a designer tries to think in CAD alone, allowing this tool to supplant creative thought.

The mind is the greatest creative instrument at our disposal. The computer is a powerful aid, but a poor stand-in.

The primary objective for our study of digital modeling is to ensure that our intent is not pushed aside by our abilities or understanding of our tools. We will set objectives and train ourselves to see obstacles clearly that we might plot routes around them.

For Students of Varying Abilities:

I am open to tailoring coursework on an individual basis to students who require a more advanced course of study. Reach me by email and explain your situation/capabilities before the second week of the semester.

Course Objectives:

- Develop operational command of SolidWorks’ basic functions including:
Model Planning, Parametric Drawing, Part Creation and Manipulation, Technical Drawing, Basics of Assemblies, File Management, Basic Rendering
- Become familiar with tools in the Model Shop. Learn to choose the appropriate tool based on objectives and use it in accordance with the guidelines of safe practices
- Practice hand-modeling techniques in conjunction with sketching to develop 3D thinking
- Plan and execute project’s development through ideation, sketching, hand modeling, 3D modeling, 3D Printing, and presentation model

Required Supplies - Many of these are likely to overlap with studio requirements. You will use all of these supplies throughout your time at NJIT and beyond. Coursework requirements will not be relaxed for unprepared students. Get this stuff soon.

- 6-Inch Calipers, digital recommended
Must be read in both Metric and Imperial. Any \$40 digital pair will last the semester if treated well
- 6-Inch Metal Machinist Ruler with Metric and Imperial Markings (Mitutoyo makes a good one)
- Large Snap Blade Knife & Blades (Olfa 5003 recommended because of its awesome locking knob)
- Small Snap Blade Knife & Blades (Olfa 5019 recommended)
- Cutting Mat
- Stanley Surform 21-115
- Sandpaper 80,120, 220
- Respirator Mask with cartridges that filter VOC's
- Dust Masks (optional, but inexpensive and more comfortable for simple tasks like sanding)
- SMOOTH drawing paper (Hammermill 24lb Laser Print paper recommended)
Leave the cold-press sketchbooks in art class! We will be pinning up, so if you draw in a book get ready to tear out lots of pages.

Various other supplies, such as paint and modeling materials will need to be acquired throughout the semester to the tune of about \$200.

Weekly Schedule

Week 1 - The Development Workflow, Intro to Model Shop

Introduction to model shop facilities & rules, names/functions/operation of tools

Bandsaw, Table, Miter Saw, Lathe, Drill Press, Sanders, Hand Tools

Planning techniques and goal-setting for multi-stage projects

Gant Chart, Critical Path Analysis

In Class - Orthographic comprehension assessment (not graded)

Homework - Orthographic Visualizations, Model Shop Worksheet

Week 2 - Intro to Solidworks

Introduction to Solidworks' interface, basics of sketching, and several simple modeling functions.

Workspace setup & hotkeys.

Sketching toward the Fully Defined Condition, Dimensions & Relations. Extrude Boss/Cut, Revolve/Revolve Cut

In Class - SW Demo of

Homework - SW-Simple Primitives, acquire 2" unskinned EPS foam (home improvement store)

Week 3 - Foam Intro, Sketch-Driven Parametric Modeling

Creating volumetric forms by manipulating EPS foam

Surform, Knives, Sandpaper

Introduction to parametric sketching and its impact on model behavior

Circular Pattern, Radial Pattern, Fillet, Solid Body Persistence, Appearances, Feature Dependency & Parent/Child Relations, Convert Entities

In Class - Demo of foam-forming techniques, SW-Demo of parametric modeling

Homework - SW-Remote, Three Foam Forms

Week 4 - Foam Finishing, Working with Sketch & Model References

Techniques for refining foam's appearance

Joint Compound, Primer, Spray-paint, Clear-coat

Demonstration of alternatives to direct numerical input for controlling features

Lofts, Reference Geometry, Up to Point/Vertex/Surface, From Surface, Offset from Surface, Through All

In Class - Demo of Foam, SW Demos and practice

Homework - SW-SuperDantendo Controller

Week 5 - Table Saw, Miter Saw & Lathe Demo, Further Work with Revolves

Students will be shown safe use of the table and miter saws. Lathe setup will be demonstrated, following a drawing to produce an accurate result

Additional solid body functions + curves

Extrude Thin, Revolve Thin, Shell, Boolean Operators, Sweep, Spiral, Projected Curve

In Class - Demo Lathe, Demo of Techniques Used to Model a Water Bottle

Homework - SW-Vacuum Bottle with Lid

Week 6 - Triage & Time-Travel

Students will use SolidWorks' feature tree to make revisions as an alternative to hack and slash modeling, and coping with any errors that arise

Roll Back Function, Manipulating Parent/Child Relationships, Model Surgery

In Class - Demo Model Surgery

Homework - SW-Revision Project

Week 7 - Foamcore

Through demonstrations and practice, students will learn the strengths and weaknesses of foamcore

Foamcore, Cutting Jigs, Cleverness

In Class - Demo Foamcore

Homework - Wearable Foamcore VR Headsets

Week 8 - 3D Printing, Prop Project; Planning

Beginning of a three-week project from sketch to physical model of an original hand-held movie prop

In Class - 3D Print Setup, Written Project Plan, Research/Sketching

Homework - Concept Outline, Gant Chart

Week 9 - From Paper to 3D and Back

Students will use Solidworks' Sketch Picture function to guide a computer model, then use SW to create a set of 1:1 scale drawings

Sketch Picture, Drawing Basics

In Class - Demo 2D-3D-2D Iterative Process, Exercise

Homework - Continued work on Prop Project, Prepare Presentation

Week 10 - Prop Project; Progress Review, Metrology

Students will each give a curated three minute class presentation on their concept, plan, and progress.

Students will use measuring tools and planning to reproduce an existing object in Solidworks

Strategic vs Tactical use of the Smart Dimension Tool, Calipers

In Class - Presentations, Demo Measuring Existing Objects

Homework - Complete Prop Project Deliverables

Week 11 - Project Presentations, All Deliverables Due

Students will make a five minute presentation of their concepts.

In Class - Presentations

Homework - Writing Instrument Placeholder & Tool Holder Models

Week 12 - Thanksgiving Break

Week 13 - Assemblies, Casting, Final Project Introduction

Students will use Solidworks' Assembly feature to visualize their writing instruments in their tool holder models

Assembly, File Linking

Students will explore the process of casting and develop a plan that will allow them to successfully create a mold for their Tool Holder

Draft Angles, Casting Silicone, Plaster Cloth, Mother Molds

In Class - Demo Casting, Demo Assembly Setup, Constraints, and File Structure

Homework - Constrained Assembly, Physical Model of Tool Holder for use in Casting

Week 14 - Castings, Vacuum-Forming, & Presentation Boxes

Students will have class-time available for completing the final project

Vacuum Former

In Class - Demo Vacuum Forming, Work on Final Projects

Homework - Final Project

Week 15 - Last Class

Students will present their projects in class

In Class - Final Project Review