Fall Term  
Undergraduate & Graduate Levels  
4.500  

**Design Computing: Art, Objects and Space**  
Prof. Larry Sass  
l sass@mit.edu  

**Lecture:** Mon 9:30 – 11:00 AM (n52-399)  
**Lab:** Wed 7:00-8:30 PM (n52-399)  
(2-2-8) Credits  

Maximum of 15 students  
*Course 4 Majors have preference*  
Wait List Confirmed by Friday  

**Introduction**  
Product designers, engineers and architects use 3D modeling programs to model, render and fabricate ideas and products. A growing trend is 3D printing of geometric models by expert designers and novices alike to build ordinary items such as jewelry, toys and replacement parts (Making). Unfortunately for those new to modeling many questions arise when considering which modeling method works best for a given modeling task. Today there are at least four ways to generate geometric models from a wide array of commercial CAD programs. To add to the confusion there are many questions related to best modeling practices for each type of output, trending software systems and emerging techniques related to plugins.  

In response to these and many other questions this course teaches the fundamentals of geometric modeling for a variety of output methods and devices. Each week we explore a specific modeling method geared towards design output. We will cover the fundamentals in the first four weeks to build skills. Next, we focus on design processing and a specific product. Students are required to complete museum quality models that will be evaluated by experts at various times throughout the term.  

**Learning Objectives**  
- Production of design ideas and physical artifacts  
- Introduction to three principle modeling techniques  
  (Surface, Solid & Mesh)  
- Introduction to design prototyping and design visualization  

**Grading**  
- Application of modeling, visualization and prototyping techniques  
- Quality of output  
- Response to questions related to process  
- Time to complete assignments & attendance  

**Attendance**  
- We meet approximately 21 times within the semester  
- More than 3 absences can lead to a failing grade, this includes lab times  
- Listeners are not allowed: this is a hands-on studio course. Similarly, pass/fail is not an option  

**Course Fee**  
All students will be charged $100 for 3D Printing/Masonite & Plywood after the third week in the term
Assignments
- Final grading is an average of the 10 Exercises & Attendance
- Paper submissions only (no emailing) through Stellar Courseware
- Late Assignment – Minus 10pts one week, Minus 20 pts second week
- I do not accept assignments that are more than three weeks late

Assignment of grades

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>A+</td>
<td>97-100</td>
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<tr>
<td>A</td>
<td>93-96</td>
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<tr>
<td>A-</td>
<td>90-92</td>
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<td>B+</td>
<td>87-89</td>
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<td>B</td>
<td>83-86</td>
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<tr>
<td>B-</td>
<td>80-82</td>
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<tr>
<td>C+</td>
<td>77-79</td>
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<td>C</td>
<td>73-76</td>
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<tr>
<td>C-</td>
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<td>D+</td>
<td>67-69</td>
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<td>D</td>
<td>63-66</td>
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<tr>
<td>D-</td>
<td>60-62</td>
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Schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Lecture</th>
<th>Lab</th>
<th>Exercise &amp; Projects</th>
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<tbody>
<tr>
<td></td>
<td>Monday</td>
<td>Wednesday</td>
<td>(Due Mondays)</td>
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<tr>
<td>Design Analysis</td>
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<tr>
<td>1</td>
<td>Sept 9 &amp; 11</td>
<td>1 - Designing – Analysis</td>
<td>Points and Lines</td>
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<td></td>
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<td>1 - Line Drawing</td>
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<tr>
<td>2</td>
<td>Sept 16 &amp; 18</td>
<td>2 – Computing – Analysis</td>
<td>Solid Modeling</td>
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<td>2 – 3D Modeling</td>
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<tr>
<td>3</td>
<td>Sept 23 &amp; 25</td>
<td>3 – Prototyping</td>
<td>3D Printing</td>
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<td>4 – FDM Printing</td>
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<tr>
<td>4</td>
<td>Sept 30 &amp; 2</td>
<td>4 – Visualization</td>
<td>Rendering 1</td>
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<td>3 – Lighting Studies</td>
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<tr>
<td>Quarter Scale Design</td>
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<tr>
<td>5</td>
<td>Oct 7 &amp; 9</td>
<td>No Lecture</td>
<td>Presentation 1</td>
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<td>Institute Holiday</td>
<td>5 – Idea Sketch (Part 1)</td>
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<td>6</td>
<td>Oct 14 &amp; 16</td>
<td>5 – Experience &amp; Function</td>
<td>Mesh Modeling</td>
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<td>5 – Line Drawing (Part 2)</td>
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<td>7</td>
<td>Oct 21 &amp; 23</td>
<td>6 – Forming</td>
<td>Loft &amp; Surface Modeling</td>
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<td>6 – Formal Design</td>
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<td>8</td>
<td>Oct 26 &amp; 28</td>
<td>7 – Design Synthesis</td>
<td>3D Printing</td>
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<td>7 – Prototype</td>
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<td>Full Scale Design</td>
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<tr>
<td>9</td>
<td>Nov 4 &amp; 6</td>
<td>8 – Detail Design</td>
<td>CNC 1</td>
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<tr>
<td>10</td>
<td>Nov 11 &amp; 13</td>
<td>No Lecture</td>
<td>Presentation 2</td>
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<td>Institute Holiday</td>
<td>8 – Detailing</td>
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<tr>
<td>11</td>
<td>Nov 18 &amp; 20</td>
<td>9 - Mockups</td>
<td>No Lab</td>
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<td>Thanksgiving</td>
<td>9 - Modulation</td>
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<tr>
<td>12</td>
<td>Nov 25 &amp; 27</td>
<td>10 – Features and Finishing</td>
<td>CNC 2</td>
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<td>10- Features &amp; Finishing</td>
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<tr>
<td>Production</td>
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<tr>
<td>13</td>
<td>Dec 2 &amp; 4</td>
<td>Open Production</td>
<td>Open Production</td>
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<td>No Exercise</td>
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<tr>
<td>14</td>
<td>Dec 9</td>
<td>10 - Final Presentation</td>
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</table>
1. Lecture Mondays 9:30AM - Labs Wednesday 7:00PM in the same room
2. Professor - Larry Sass lsass@mit.edu Room - 7-304
3. Teaching Assistances
   - Wonki Kang kwkng@mit.edu
   - Bowen Lu bwl@mit.edu
5. Learning Objectives
   - How to produce design ideas and artifacts
   - Introduction of three principle modeling techniques (Surface, Solid & Mesh)
   - Introduction of design prototyping and visualization
6. Grading
   - Completion of all 10 assignments
   - Quality of output
   - Response to questions related to process
   - Time to complete assignments & attendance
7. Attendance
   - We meet 21 times within the semester
   - More than 3 absences can lead to a failing grade, this includes lab times
8. Assignments
   - Final grading is an average of the 3 Projects (no final exam)
   - Paper submissions only (no emailing) through Stellar Courseware
   - Late Assignment – Minus 10pts one week, Minus 20 pts second week
   - I do not accept assignments that are more than three weeks late
9. **Time**
   - Time is not a measure of excellence
   - The course is 12 Units
     - 2 Hours Lecture
     - 2 Hours Lab
     - 8 Hour Assignment
   - Email lsass@mit.edu if the assignment is taking more than 5 hours
   - Machines break
   - Computers crash

10. **Course Fee**
    All students will be charged $100 for 3D Printing, Masonite and Plywood after the third week in the term

11. **Laptop Setup (Your computer)**
    - You will need to use your own laptops for this course
    - Best if your computer is less than 4 years old and you will need at least a gig of space for software and images.
    - PROCESSOR: core i7 - 4 cores
    - HARD DISK: SSD (no old mechanical spinning drive)
    - 60GB free space
    - RAM: 16GB
    - Take 2 Hours to Setup your computer (Download Software)
    - Laptop support – cron@mit.edu

12. **Software**
    - AutoCAD [http://Autodesk.com](http://Autodesk.com)
    - 3D Studio Max [Autodesk.com](http://Autodesk.com)
    - Dropbox and Crashplan
    - Optional: Adobe Suite/Creative Cloud
      - InDesign
      - Photoshop

13. **Department of Architecture Public Computers**
    - These computers should support all of your computational needs Studio 7 (7-433) & studio 3 (3-415),
14. **The IDC**

- Downstairs (outside) doors without card:
  M-W 6AM-8PM
  
  Thursday 6AM-7PM
  
  Friday 6AM-8PM

- Main IDC (International Design Center)
  Needs ID for entry
  
  Door are open M-F 8AM – 6PM
  
  Orientation: Needed for access to IDC main door access
  
  Shops: Card Access Only
15. Design Software (3D Modeling & Visualization)
   a. **AutoCAD
   b. **Rhinoceros
   c. Blender
   d. SolidWorks
   e. 3D Max
   f. Maya
   g. Inventor
   h. Tinkercad
   i. ZBrush
   j. Cinema 4D
   k. Opend CAD
   l. 123D Design
   m. Modo
   n. Fusion 360
   o. Meshmixer
   p. Lightwave
   q. Sculptris
   r. FreeCAD
   s. Mol3D
   t. 3Dtin
   u. Wings3D
   v. K-3D
   w. BRL-CAD