Spring Term
Under Graduate & Graduate Levels
4.501/4.511

Advanced Projects in Design Fabrication
Prof. Larry Sass
Tuesday & Thursday 9:00-11:00 AM
(3-0-9) Credits - N52 3rd Floor
Last Update 02-03-2019

Introduction
This seminar explores theories and methods of design with a focus on digital fabrication. The purpose of the course is to serve as an intermediate step towards the use of fabrication tools in design studio & design practice. The course is also aimed at supporting undergraduate & graduate research in the area of fabrication. The emphasis of the course is on process and application to develop new theories of design production based on physical outcomes. The course deliverable is a 10 assignments & a Final Project.

The environment is half that of a studio where larger design visions are broken into weekly assignments using advanced modeling tools and fabrication devices. The emphasis is on design learning through in depth studies and testing new researched systems. Advanced learning is accomplished through hands on tutorials student investigations of the particular system that we explore that week and physical execution. Projects range from small furniture design to full scale physical mockups.

Who should take this course?
This course is designed for advanced course four undergraduates, second- and third-year MArch or first year SMArchS students interested in guided experimentation with CNC machines. Second, the course is also suited for designers interested in learning a research workflow from physical project planning to conference presentations and research writing. Basic 3D Solid Modeling techniques, laser cutting and 3D printing are required for the course.

Learning Objectives
- Production of designs as physical artifacts
- Introduction to CNC Fabrication & Machining
- Digital Fabrication Systems of Production (3D Printing, Laser Cutting, CNC)

Grading
- Quality of products
- Completion of all 10 assignments and Final Project
- Time to complete assignments & attendance

Attendance
- We meet approximately 24 times within the semester
- More than 3 absences can lead to a failing grade, this includes lab times

Assignments
- Final grading is an average of the 10 Exercises & Final Assignment
- Paper submissions only (no emailing) through Stellar Courseware

Course Fee
All students will be charged $100 for 3D Printing/Masonite & Plywood after the third week in the term
<table>
<thead>
<tr>
<th>Date</th>
<th>Design</th>
<th>Modeling Method</th>
<th>Machine</th>
<th>Material</th>
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<tbody>
<tr>
<td>1 Feb 5 &amp; 7</td>
<td>Single Curvature</td>
<td>Surface Modeling</td>
<td>Laser Cutting</td>
<td>Bristol Board</td>
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<tr>
<td>2 Feb 12 &amp; 14</td>
<td>Double Curvature</td>
<td>Mesh Modeling</td>
<td>Laser Cutting</td>
<td>Masonite</td>
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<tr>
<td>3 Feb 21</td>
<td>Plate Forming</td>
<td>Solid Modeling</td>
<td>Laser Cutting</td>
<td>Masonite</td>
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<tr>
<td>4 Feb 26 &amp; 28</td>
<td>Chair Analysis</td>
<td>Analysis</td>
<td>Paper Printout</td>
<td>Drawings</td>
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<tr>
<td>5 Mar 5 &amp; 7</td>
<td>Chair Discovery</td>
<td>User Experience</td>
<td>3D Printing</td>
<td>Stereo Lithography</td>
</tr>
<tr>
<td>6 Mar 12 &amp; 14</td>
<td>Chair Design</td>
<td>Formal Modeling</td>
<td>Laser Cutting</td>
<td>Masonite</td>
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<tr>
<td>7 Mar 19</td>
<td>Chair Development</td>
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**Design**

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<tbody>
<tr>
<td>8 Apr 2 &amp; 4</td>
<td>Chair Prototyping</td>
<td>Assembly Modeling</td>
<td>CNC 1</td>
<td>Plywood &amp; Plastic</td>
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<tr>
<td>9 Apr 9 &amp; 11</td>
<td>Chair Decomposition</td>
<td>Modulation</td>
<td>CNC 2</td>
<td>Plywood &amp; Plastic</td>
</tr>
<tr>
<td>10 Apr 18</td>
<td>Chair Detailing</td>
<td>Mockup</td>
<td>CNC 3</td>
<td>Plywood &amp; Plastic</td>
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<tr>
<td>11 Apr 23 &amp; 25</td>
<td>Chair Detailing</td>
<td>Integration</td>
<td>Omax Waterjet</td>
<td>Metal</td>
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**Design Synthesis & New Systems**

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<tbody>
<tr>
<td>12 Apr 30 &amp; 1</td>
<td>Open</td>
<td>Open</td>
<td>Open</td>
<td>Fab &amp; Finishing</td>
</tr>
<tr>
<td>13 May 7 &amp; 9</td>
<td>Open</td>
<td>Open</td>
<td>Open</td>
<td>Fab &amp; Finishing</td>
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Tuesday - May 14

**Final Presentation**
Course Administration

1. Lecture Tuesday 9:00-11:00 AM & Thursday 9:00-11:00 same room
2. Office Hours – email to setup office hours
   lsass@mit.edu Room - 7-304 (617 435 8397 Cell)

3. Teaching Assistances Hours
   • Molly Mason molmason@mit.edu
   • Nathaniel Elberfeld njelbe@mit.edu


5. 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

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

7. 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.
   • Take 2 Hours to Setup your computer (Download Software)
   • Laptop support – cron@mit.edu

8. Software
   • AutoCAD http://Autodesk.com Main CAD Software
   • Rhino http://www.studica.com/ http://www.studica.com/ (You will need to purchase a license)
   • Dropbox and Crashplan

9. Woodshop
   • Christopher B. Dewart
   • Manager, Woodshop chdewart@mit.edu
10. The IDC

- Needs ID for entry
- Orientation: Needed for access to IDC main door access
- Shops: TBD

11. 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