

Arch 3690 - Spring 2014

Intermediate Computation and Fabrication

Tue. 11:30 pm - 1:35 pm | Fri. 11:30pm - 1:35pm

Prof. Joseph Vidich (*jvidich@citytech.cuny.edu*)

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Department of Architectural Technology
New York City College of Technology
City University of New York
300 Jay Street, Brooklyn, New York 11201

COURSE SYLLABUS

Department of Architectural Technology | B. Tech. in Architectural Technology

ARCH 3690 Intermediate/Advanced Parametric Computation and Digital Fabrication
4 lab/studio hours, 6 credits, 3 units
Prerequisites: ARCH 3590 Introduction to Computation and Fabrication

COURSE DESCRIPTION:

This course, the second in the digital fabrication certificate sequence (following ARCH3290) focuses on the development of parametric tools and digital prototyping techniques and practice. Beginning from the study of precedents of modern architectural fabrication—both digital and non-digital-- the course will develop a comprehensive understanding of exemplary construction and tectonic systems, as well as allowing students to develop a proficiency in applying this knowledge in constructing associative/parametric digital models that utilize tools to generate alternative variations of these systems.

An integral part of the course involves the study of parametric modeling in Rhino 3D and Grasshopper. The course will also include dedicated workshops on digital fabrication equipment including the CNC router, lasercutter, and 3D printer. The output of the course will be a digitally modeled and fabricated facade component, involving complex geometry. Students will have come away from the course with digital and material models, and documentation of the structural characteristics of the materials and fabrication techniques used.

REQUIRED TEXT:

Alayna Fraser, "Translations: de Young Museum and the Walker Art Center," Praxis 9, 2007
An Atlas of Fabrication, Barkow Leibinger, AA Publications, 2009
Digital Fabrication: Architectural and Material Techniques, Lisa Iwamoto, Princeton Architectural Press, 2009
The Function of Ornament, Farshid Moussavi and Michael Kubo, Actar, Barcelona, 2008

RECOMMENDED TEXTS:

Tooling, Pamphlet Architecture 27, Aranda/Lasch, Princeton Architectural Press, 2006
The Function of Form, Farshid Moussavi, Actar, Barcelona, 2009
Atlas of Novel Tectonics, Reiser + Umemoto, Princeton Architectural Press, 2006
Studies in Tectonic Culture. Kenneth Frampton, Cambridge, MA: MIT Press, 1995.
The Nature and Art of Workmanship, David Pye, Herbert Press, London, 1995
The Nature and Aesthetics of Design, David Pye, Herbert Press, London, 1978
Architecture in the Digital Age: Design and Manufacturing, ed. Branko Kolarevic, Taylor & Francis, New York, 2003
Refabricating Architecture, Stephen Kieran + James Timberlake, McGraw-Hill, 2004
From Control to Design: Parametric/Algorithmic Architecture, Michael Meredith, Actar Publishing, New York, 2008
Manufacturing Material Effects, Branko Kolarevic and Kevin Klinger, Everbest Printing Co., China, 2008

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LEARNING OBJECTIVES:

Upon completion of the course, students should be able to

1. Demonstrate an advanced understanding of digital tools and how they can be applied to solve architectural digital fabrication problems.
2. Demonstrate intermediate / advanced knowledge of parametric software (Grasshopper), including solid modeling, polygons and mesh techniques, and a fundamental knowledge of coding
3. Demonstrate ease in carrying out iterative workflows across multiple software platforms including modeling, parametric functionality, and analysis
4. Demonstrate proficiency in detailing, assembly and digital tectonics
5. Illustrate proficient knowledge of mill set up, basic machine maintenance, and safety procedures
6. Display proficiency in best practices for 3D modeling for laser cutter operation through surface
7. Illustrate an understanding of precedents of digital fabrication in other industries [ie. ship building, automotive industry, industrial design]
8. Carry out production/assembly of small-scale prototype(s)
9. Demonstrate flattening/building and contouring, and in operating laser cutters
10. Demonstrate knowledge for creating profiling, drilling, and surfaces modeling drawings for use with a CNC mill. Show applied understanding of mill software interfaces (RhinoCAM)
11. Combine manual fabrication techniques (such as heat bending and component assembly) with digital fabrication techniques

COURSE SCHEDULE:

Project 1: Glueless Plexi Sphere

Due: Friday, Feb. 21st

Students will be required to construct a sphere or sphere-like object out of 1/8" acrylic. The assembly of parts must be held together without the use of adhesives or hardware.

Project 1: Museum Facade

- *Assignment 2a*

Due: Friday, Feb. 28th

Students will select a museum for a list and create a precedent research document to be presented to the class.

- *Assignment 2b*

Due: Friday, Mar. 28th - (Midterm Review)

Students will design a museum facade, focusing on a wholistic concept.

- *Assignment 2c*

Due: Friday, May. 2nd - (3/4 Review)

Students will focus on a small portion, or "chunk" of their facade, refining materiality, details, and possible methods of fabrication.

- *Assignment 2d*

Due: Friday, May. 23rd - (Final Review)

Students will produce a comprehensive design presentation as well as a fully fabricated "chunk" of the facade.

SCHEDULE AS OF 1.28.14

	SUN	MON	TUE	WED	THU	FRI	SAT
JAN		27 1ST DAY CITYTECH	28 CLASS INTRO / INTRO TO PROJ. 1 <i>BEGIN PLEXI SPHERE DESIGN</i>	29	30	31 PRELIM DESIGN DUE - DESK CRITS <i>PLEXI SPHERE 3D MODEL</i>	01
	02	03	04 3D MODEL DUE - DESK CRITS <i>PLEXI SPHERE 1ST PROTOTYPE</i>	05	06	07 1ST PROTOTYPE DUE - DESK CRITS <i>PLEXI SPHERE 2ND PROTOTYPE</i>	08
FEB	09	10	11 2ND PROTOTYPE DUE - DESK CRITS <i>PLEXI SPHERE 3RD PROTOTYPE</i>	12 <i>COLLEGE CLOSED LINCOLN'S BDAY</i>	13	14 3RD PROTOTYPE DUE - DESK CRITS <i>PLEXI SPHERE FINAL PROTOTYPE</i>	15
	16	17 <i>COLLEGE CLOSED WASHINGTON'S BDAY</i>	18 FINAL PROTOTYPE DUE - DESK CRITS <i>LAST DAY TO WITHDRAW W/O (W)</i>	19	20 <i>COLLEGE FOLLOWS MONDAY SCHEDULE</i>	21 PROJ. 1a DUE / PROJ. 1 REVIEW INTRO TO PROJ. 2a MUSEUM FACADE PRECEDENT STUDY	22
	23	24	25 FACADE LECTURE: MUSEUM FACADES AND PARAMETRICS <i>PRECEDENT STUDY</i>	26	27	28 PROJ. 2a DUE / REVIEW GRASSHOPPER INTRO / PROJ. 2b INTRO <i>PRECEDENT COMPONENT</i>	01
MAR	02	03	04 DESK CRITS <i>FACADE CONCEPTS</i>	05	06	07 GRASSHOPPER LECTURE - DESK CRITS <i>FACADE CONCEPTS</i>	08
	09	10	11 DESK CRITS <i>FACADE CONCEPTS</i>	12	13	14 GRASSHOPPER LECTURE - DESK CRITS <i>FACADE CONCEPTS</i>	15
	16	17	18 DESK CRITS <i>FACADE CONCEPTS</i>	19	20	21 GRASSHOPPER LECTURE - DESK CRITS <i>FACADE CONCEPTS</i>	22
	23	24	25 DESK CRITS <i>FACADE CONCEPTS</i>	26	27	28 FACADE CONCEPT DUE / MIDTERM REVIEW / PROJ. 2c INTRO <i>FACADE DEVELOPMENT</i>	29
	30	31	01 CNC MILLING LECTURE - DESK CRITS <i>FACADE DEVELOPMENT</i>	02	03	04 CNC MILLING LECTURE - DESK CRITS <i>FACADE DEVELOPMENT</i>	05
	06	07	08 CNC MILLING LECTURE - DESK CRITS <i>FACADE DEVELOPMENT</i>	09	10 <i>MIDTERM GRADES DUE</i>	11 CNC MILLING LECTURE - DESK CRITS <i>FACADE DEVELOPMENT</i>	12
APR	13	14 <i>COLLEGE CLOSED SPRING BREAK</i>	15 <i>COLLEGE CLOSED SPRING BREAK</i>	16 <i>COLLEGE CLOSED SPRING BREAK</i>	17 <i>COLLEGE CLOSED SPRING BREAK</i>	18 <i>COLLEGE CLOSED SPRING BREAK</i>	19 <i>COLLEGE CLOSED SPRING BREAK</i>
	20	21 <i>COLLEGE CLOSED SPRING BREAK</i>	22 <i>COLLEGE CLOSED SPRING BREAK</i>	23	24 <i>LAST DAY TO WITHDRAW W/O (W)</i>	25 CNC MILLING LECTURE - DESK CRITS <i>FACADE DEVELOPMENT</i>	26
	27	28	29 CNC MILLING LECTURE - DESK CRITS <i>FACADE DEVELOPMENT</i>	30	01	02 FACADE DEVELOPMENT DUE / 3/4 REVIEW / PROJ. 2d INTRO <i>FACADE FABRICATION</i>	03
MAY	04	05	06 DESK CRITS <i>FACADE FABRICATION</i>	07	08	09 GRAPHIC REP. LECTURE - DESK CRITS <i>FACADE FABRICATION</i>	10
	11	12	13 DESK CRITS <i>FACADE FABRICATION</i>	14	15	16 GRAPHIC REP. LECTURE - DESK CRITS <i>FACADE FABRICATION</i>	17
	18	19	20 DESK CRITS <i>FACADE FABRICATION</i>	21	22	23 FINAL REVIEW - END OF SEMESTER	

ASSIGNMENT 01
GLUELESS PLEXI SPHERE

FINALIZATION AND ASSEMBLY
OF SPHERE PIECES

ASSIGNMENT 02a
MUSEUM PRECEDENT STUDY

ASSIGNMENT 02b
DESIGN AND DEVELOPMENT
OF FACADE COMPONENTS
(BEGIN GROUP WORK)

FINALIZATION OF CONCEPT
PRESENTATION AND MODEL

ASSIGNMENT 02c
DEVELOPMENT AND
FABRICATION OF
FACADE COMPONENTS

COMPLETION OF FACADE
PROTOTYPE

ASSIGNMENT 02d
FINALIZATION AND
FABRICATION OF
FACADE COMPONENTS

FINALIZATION OF
FACADE COMPONENT

* Note: This is a tentative schedule and open to revision as the semester progresses