

Fall 2018

ID 340-001: Materials and Processes

Matthew Negron

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ID 340 - “Materials and Processes” (3 Credit Hours – Lecture/Lab)

Course Description:

The student will be introduced to the basic materials and processes used in manufacturing of both short run and mass-produced objects. The course will comprise of lectures, field trips and design exercises employing both traditional and state-of-the-art manufacturing processes.

Prerequisite(s): Junior level or higher.

Professor’s Name: Matthew Negron

Department: Industrial Design

Location: 260 Weston Hall

E-mail: mcn3@njit.edu

Office Hours: By appointment only

Course Goals:

- To develop methodologies to evaluate materials and processes on a project as a thinking tool
- To develop methodologies to compare materials and processes on a project as an analysis tool
- To develop methodologies for decision making on appropriate materials and processes based on the project requirements
- To develop strategies for moving from a thinking tool to a communication tool
- To develop techniques for using visualization as a persuasive communication technique
- To develop critical thinking abilities to conceptualize and communicate
- To employ materials and processes to support and/or drive various design processes

Course Outcomes:

- Students will apprehend materials and processes as a thinking, analysis and communication tool
- Students will integrate research based outcome into various aspects of their design process
- Students will develop their own personal strategies on how to think and effectively communicate
- Students will develop an understanding of how selecting appropriate materials and processes will help them as professionals
- Students will develop improved drawing, layout, composition, modeling and communication skills
- Students will build confidence to use modeling with the accurate materials and processes as a design tool

Attendance Policy:

There are no excused absences. The accumulation two unexcused absence will result in a loss of one letter grade. The accumulation of three unexcused absences will result in the student’s failure for the class. If the student has excused absence it is his/her responsibility to catch up with the rest of the class and make sure to ask for any handouts or assignments that may have been missed. If you are going to miss a class an email should be sent along with the reason for the absence.

Grading Standards:

A	Superior (4.0), Superior
B+	Excellent (3.5), Excellent
B	Very Good (3.0), Very Good
C+	Good (2.5), Good
C	Acceptable (2.0), Acceptable
D	Minimum (1.0), Minimum
F	Inadequate (0.0), Inadequate

Grading

- Attendance & Participation (Critique) / 10%
- Individual Presentation #1 10%
- Individual Presentation #2 / 25%
- Group Presentation #1 / 20%
- Group Presentation #2 / 15%
- Exam #1 / 10%
- Exam #2 / 10%

Extra Help Session (s):

As necessary and by appointment. Emails are always welcomed and encouraged for questions and/or more information about a particular topic.

Late Work

Work handed in late will be penalized by 5% for each day late after the due date. If you miss a presentation there will be a deduction of 15% of your total grade for each week late after the initial presentation date. If you are going to hand in an assignment late or miss a presentation an email must be sent, or the work will not be counted.

Cell Phone Use

Cell phones should not be used during the class unless if it's for an educational purpose and/or with assistance during a presentation. Cell phones may be used in between class breaks.

Laptop Use

Laptops may be brought to class, but should be used for taking notes, class research, and/or presentations.

Accommodations / Disability

If you need an accommodation due to a disability please contact Chantonette Lyles, Associate Director of the Office of Accessibility Resources and Services, Fenster Hall Room 260 to discuss your specific needs. A Letter of Accommodation Eligibility from office authorizing student accommodations is required.

Honor Code

The NJIT Honor Code will be upheld and if you need additional information please refer to the ACADEMIC INTEGRITY CODE on the NJIT website, or [CLICK HERE](#) to access an online PDF of the policy.

Academic Conduct and Honesty:

Each student is responsible for reading and conducting within the parameters of NJIT University Code on Academic Integrity. Please refer to NJIT website for the text of policy.

Right to Use Artwork:

The college reserves the right to use student work and photographs or videotapes of students and their work for display, documentation, instruction and in publications or other materials about the college. Only NJIT faculty or authorized staff may remove work from walls or displays.

Projects & Assignments

Individual Presentations

#1, 09/11 – Past Reflection

Select a past project focused on an aspect of product design and propose your method(s) of manufacturing along with the steps in the process of manufacturing. Devise a method of how the product would be assembled during production. The presentation should be 7 – 10 minutes, which will follow with a short review.

#2, 12/11 – Current Reflection

Analyze your current final studio project and review the process of manufacturing along with materials being incorporated. The presentation should be a step-by-step process from prototyping to product being delivered to the end user. The presentation should include manufacturing techniques, materials being used, how the product will be assembled, and process to market. The presentation should be 15 – 20 minutes.

Group Presentations

#1, 11/06 – Product Redesign

Choose a household product with a minimum of 30 parts, which includes fasteners (screws, clips, pins, and etc.) and create an accurate 3D model (parts & assembly) of the product along with a Bill of Materials & Exploded Parts Diagram using SolidWorks. Redesign the product to eliminate and combine parts to increase process efficiency. Core concepts from classes 2, 3, & 4 should be incorporated into the presentation as justification for the design changes. The final model should be completed in SolidWorks along with a revised Bill of Materials and Exploded Parts Diagram.

Groups:

- **Group 1**
 - Haian
 - Jenna
 - Brent
 - Mehek
- **Group 2**
 - Jayna

- Andrew
- Daniel
- **Group 3**
 - Richard
 - Emily
 - Ben
 - Patrick
- **Group 4**
 - Masha
 - Morks
 - Alexis

#2, - 12/04 - Material & Manufacturing Exploration

A material selection (wood, metal, plastic, glass, and etc.) will be assigned to each group where the different sub-categories of the material will be explored along with the various forms of manufacturing. Relevant real life examples will need to be built into the presentation. Along

with

the presentation their will need to be a (5) page paper.

Groups:

- **Group 1**
 - Brent
 - Daniel
 - Alexis
- **Group 2**
 - Mehek
 - Morks
 - Haian
 - Jenna
- **Group 3**
 - Masha
 - Patrick
 - Richard
- **Group 4**
 - Ben
 - Andrew
 - Jayna
 - Emily

Exams

#1, Review of Classes 2, 3, 4, 5, & 6

#2, Review of Classes 8, 9, 10, 11, & 13

Class Schedule

Class #	Date	Topic
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1	09/04	<p><i>Class Introduction</i></p> <p>Individual Presentation #1 Reviewed</p> <p>Group Assignment #1 Reviewed</p>
2	09/11	<p><i>Individual Presentation #1</i></p> <p><i>New Product Design (NPD) Process</i></p> <ul style="list-style-type: none"> ● Four Phases in an NPD Process ● Product Development Objectives <ul style="list-style-type: none"> ○ Primary, Product Design ○ Secondary, Assembly Process Design ● Concurrent Engineering & Sequential Design Process ● Product Definition: The Elevator Pitch ● Kano's Model of Customer Satisfaction
3	09/18	<p><i>Design for Assembly & Manufacturability (DFA/DFM)</i></p> <ul style="list-style-type: none"> ● What is the Assembly Plan (Process Plan)? ● Design for Manufacturability ● Design for Assembly ● Manufacturing Cost Drivers ● DFM Examples
4	09/25	<p><i>Design Efficiency</i></p> <ul style="list-style-type: none"> ● Value Engineering & Cost Reduction ● Part Reduction & Eliminating Parts ● Combining Parts ● Factors that Influence Assembly Time ● Product Examples of Part Reduction ● Brief Review of Lean Manufacturing
5	10/02	<p><i>Wood, Material Review & Manufacturing Techniques</i></p> <ul style="list-style-type: none"> ● Soft Woods & Hard Woods ● Joinery Techniques ● CNC Techniques & Laser Cutting ● Lathing ● Structural Wood Molds ● Steam Bending ● Lamination & Veneer Techniques
6	10/09	<p><i>Group Presentation #1</i></p> <p><i>Plastic, Material Review & Manufacturing Techniques</i></p> <ul style="list-style-type: none"> ● Properties of Polymers

		<ul style="list-style-type: none"> ● Types of Plastic Molding & Application Examples ● Thermoforming Techniques ● Plastic Extrusions & Die Types ● Techniques to Fasten Plastic Parts ● Tips & Tricks with SolidWorks
7	10/16	<p>Multi-Factory <i>Field Trip</i></p> <ul style="list-style-type: none"> ● <i>North American Plywood - Parsippany, NJ</i> <ul style="list-style-type: none"> ○ CNC Machines ○ Lamination & UV Finishing ○ Ink Printing on Wood ● <i>Dauphin – Boonton, NJ</i> <ul style="list-style-type: none"> ○ Product Assembly ○ Upholstery & Sewing Techniques ○ Gate-to-Gate Techniques ● Faber Precision - Rockaway, NJ <ul style="list-style-type: none"> ○ Welding ○ Plasma Cutting ○ Metal Lathing
8	10/23	<p>REMOTE CLASS <i>Exam #1, Take Home Exam</i></p> <p>Glass & Ceramic Techniques</p>
9	10/30	<p>REMOTE CLASS</p> <p>Finishing Techniques</p> <ul style="list-style-type: none"> ● Powder Coating, Anodizing, & Plating ● Polishing & Grinding ● Spray Painting & Lacquer ● Screen Printing ● Ink Printing on Wood ● Dip Molding
10	11/06	<p><i>Metal, Material Review & Manufacturing Techniques</i></p> <ul style="list-style-type: none"> ● Laser, Water Jet, & Plasma Cutting ● Lathing ● EDM, Die Sink & Wire ● Metal Forming ● Ways to Fasten Metal ● SolidWorks Sheet Metal
11	11/13	<p>Rapid Prototyping & Short Run Production</p> <ul style="list-style-type: none"> ● Advantages & Disadvantages ● Additive Processes

- Mold Making & DIY
- Bartering with Local Sources
- Working with Vendors
- Off-the-shelf Parts
- Compromising: Balancing Speed, Desired Features, and Cost

12	11/20	NO CLASS (Thursday Classes Meet)
13	11/27	Mass Production <ul style="list-style-type: none"> ● Advantages & Disadvantages ● Volume & Capital Cost ● Risk Assessment ● Assembly Line ● Supply Chain & Logistics ● Local versus Overseas Exam #2, Take Home
14	12/04	Group Presentation #2
15	12/11	No Class, Group Paper for Group Assignment #2 Due
16	12/18	Individual Presentation #2

***Note:** Course Change Policy: *Schedule subject to change at the discretion of the Professor and to benefit the class. Changes will be communicated in class with amended handouts.*

Recommended Text(s):

Chris Lefteri, *Making It: Manufacturing Techniques For Product Design*, Laurence King (2012)
ISBN 9781856697491

Rob Thompson, *The Manufacturing Guides_ Prototyping And Low Volume Production*,
Thames & Hudson (2011) ISBN 9780500289181

Rob Thompson, *The Manufacturing Guides_ Product and Furniture Design*,
Thames & Hudson (2011) ISBN 9780500289181

Jim Lesko, *industrial design materials and manufacturing guide 2nd Edition*,
John Wiley & Sons, Inc. (2008) ISBN 978047005538

Jennifer Hudson, *Process 50 Product Designs from Concept to Manufacture*,
Laurence King Publishing (2008) ISBN 9781856695411

David Bramston, *Basics Product Design 02: Materials Thoughts*, Fairchild Books (2009)



ISBN 9782940373871