ID 340. Materials and Processes.

Restrictions: Junior level or higher.

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 consist of lectures, research, analysis and exercises involving both traditional and state-of-the-art manufacturing processes.

Instructor - Martin Short
Fall 2025 ID340.
Tuesdays 8.30am-9.50am. Thursdays 8.30am-9.50am
Location: rm 220, Central King building
Credits: 3

Overview -

As industrial designers we are tasked with shaping new ideas and concepts into real and manufacturable products and solutions.

Without understanding the wide range of materials, manufacturing processes, and finishes available we cannot fully realize these ideas in their fullest and most useful forms. Additionally the continual development of new materials and manufacturing techniques can provide great inspiration and opportunities for the next generations of design solutions and product ideas.

Students will be charged with their own research and analysis of information for presentation to the class and subsequent discussion.

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Course objectives

Throughout the course, we will examine a range of materials and manufacturing processes and discuss their attributes and suitability for varying applications. Students will be expected to prepare and present research on materials and technologies and present this work in a convincing manner.
This will allow each student to focus on the following objectives:

• To develop an awareness of various materials that designers have at their disposal.
• To gain an understanding of the ways in which materials can be processed, formed and combined through manufacturing methods into products.
• To develop an understanding of the properties, advantages, and opportunities that these materials and processes offer.
• To gain and understanding of the energy and resources used in obtaining these materials, and the requirements and effects of the varying processes.
• To gain an understanding of the after-manufacture effects of varying materials and processes.
• To develop research strategies for gaining knowledge on materials and processes relative to future project and design needs.
• To develop methodologies for decision making on appropriate materials and process choices in the design process based upon knowledge gained in this course and subsequent research.
• To develop a personal sense of curiosity, scrutiny and applicable knowledge for materials and processes that can be applied to future design work.
• To develop the communication and presentation skills required to share and discuss this gained knowledge.

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Course structure and schedule

All students are expected to attend all classes, and participate in group-discussions.
Student presentations are a mandatory part of the course and should be seen as an invaluable opportunity for learning
Project assignments will be issued throughout the semester. Each assignment is due at the beginning of the class on the due date for review. Students should always be prepared to present their work to the class.
Each entire project assignment should be submitted in digital form, at the beginning of each review.
The following schedule may be subject to change throughout the course, and it is the student's responsibility to attend class and keep track of changes..

Week	date	
1	2 and 4 Sept	Course introduction. Material & production value.
2	9 and 11 Sept	Metals.
3	16 and 18 Sept	Assignment 1 due. Metals.
4	23 and 25 Sept	Metals.
5	30 Sept and 2 Oct**	Assignment 2 presentations.
6	7 and 9 Oct	Assignment 2. Plastics.
7	14 and 16 Oct	Plastics.
8	21 and 23 Oct	Plastics.
9	28 and 30 Oct	Assignment 3 due. Ceramics
10	4 and 6 Nov	Ceramics. Organics.
11	11 and 13 Nov	Organics.
12	18 and 20 Nov	Rapid prototyping/manufacturing. .
13	25 Nov	Assignment 4 presentations.
14	2 and 4 Dec	Smart materials. Composites & Hybrid materials.
14	9 and 11 Dec	Composites & Hybrid materials.
15	16 and 18 Dec	Exam week*

* No exam will be set for this course

** wellness day

Note - each week a reading/watching assignment will be given. Be prepared for this material to appear in quiz questions.

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Course reading and resources

A portion of the course is devoted to the study of relevant literature and information on material technologies.
This resource list will be expanded upon throughout the course.

Essential reading -

• Thompson, R. 2007. Manufacturing processes for design professionals. New York: Thames & Hudson

• Ashby, M and Johnson, K. 2010. Materials and design, The art and science of material selection in product design. UK: Butterworth-Heinemann

• Lefteri, C. 2019. Making it: manufacturing techniques for product design, 3rd edition: pub - Laurence King Publishing

• Thompson, R. 2011. The manufacturing guides - prototyping and low-volume production. New York: Thames & Hudson

Recommended supplemental reading -

• Sauer, C. 2010. Made of... New materials sourcebook for Architecture and design. Berlin: Gestalten

• Brownell, B 2017. Transmaterial next: a catalog of materials that redefine our future. New York: Princeton Architectural press

• Howes, P. 2012. Material matters: new materials in design. London: Black Dog Pub

• Axel Ritter. 2006. Smart materials in architecture, interior architecture, and design: pub -Birkhäuser Architecture

• Thorsen Klooster. 2009. Smart surfaces and their application in architecture and design: pub - Birkhäuser Architecture

• Ezio Manzini, 1989. The material of invention: Material and design: pub - The MIT Press

• Kula, D. , Ternaux, É & Hirsinger, Q. 2013. Materiology: The Creative Industry's Guide to Materials and Technologies: pub - Birkhäuser.

• Beylerian, G & Dent, A. 2007. Ultra Materials: How Materials Innovation is Changing the World: pub - Thames & Hudson

• Adrian Forty, 1992. Objects of Desire: Design and Society Since 1750: pub - Thames & Hudson

Evaluation

Grades for each project are initially assessed within four days of the project being submitted for review. Final grades will be determined at the end of the semester, with the complete submission of the work for the entire semester; it will include an assessment of your individual participation (including factors such as, but not limited to, promptness, preparedness and continued attendance of class and lectures, presentation of work reviews, engagement and involvement with the class teachings), and standard of digital documentation.

Grades are determined according to the instructor's judgment of how well students achieve the objectives of the course, and specific objectives and requirements of each project assignment. All group reviews of student work are a mandatory part of the course and should be seen as invaluable opportunities of learning. Although these sessions may inform the grading by the instructor, grades are not determined by the reviews.

The value of each project assignment, as a percentage of your total evaluation for this course, is as follows:

Assignments

• Assignment 1	9%
• Assignment 2	20%
• Assignment 3	9%
• Assignment 4	20%
• Quizzes (3)	20%
• Individual participation	16%
• Digital documentation	6%

Course Grade System

• A (4.0)	superior
• B+ (3.5)	excellent
• B (3.5)	very good
• C+ (3.5)	good
• C (3.5)	acceptable
• D (3.5)	minimum
• F (3.5)	inadequate

Important Note - see page 7 for additional remification on grades for missed classes

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Digital documentation.

Digital documentation of the entire work of the semester will be required of each student.
The documentation for each assigned project is to be submitted on the day of each review, before presentations, and in adherence with the deadlines noted in the assignment.

This documentation will provide the department with a review of your study, and information contained in the digital files might be used in future electronic or printed media publications, either in whole or in part. This record will also enable interested students, faculty, and others to have access to your work in the future. Please be advised that it is highly recommended that you make a copy of the digital package for your own records. The instructor will give detailed instructions on how to submit the documentation.

The digital documentation for this class has the following requirements -

- Submissions should be made for each assignment through canvas.
- Files should be in PDF format with additional details to be provided within the assignment.
- Files should not exceed 10Mb and should be suitably sized to allow for ease of upload and download without compromising the image quality or legibility of the document
- All citations should be in Chicago style - https://www.chicagomanualofstyle.org/tools_citationguide.html

This digital documentation will be evaluated in relation to the stated objectives of the course and a demonstrative consideration of:

- The quality and legibility of the chosen images.
- The appropriateness of the images in relation to the objectives of the study.
- Selective documentation of the whole work, and significant parts of the project.
- Evidence of ambitious and thorough research.
- Craft and quality of writing.
- Adherence to the requirements listed above

Note - **all work will be subject to a Plagiarism review as per NJIT policy**. Plagiarism is taken very seriously and if found an F grade may be issued.

As designers it is imperative that we arrive at original thoughts and ideas,
and while research involves the collection of data, influential examples, and outside references,
these should all be cited to the originator/s.
While collaboration and group endeavors are a necessary part of our process,
meaningful and progressive thought (ideas, opinions, and reasoning) should always be the designer's own.

Kepler Documentation:
You will receive more information regarding how many files to post on Kepler. All files must be resized and renamed. Do NOT upload folders! Please fill out all of the metadata information. The maximum size is 2000 x 2000 pixels. Images must retain their original proportions without being enlarged. In cases where the width to height ration exceeds 3:1 you may resize the short dimension to 2000 pixels. To distinguish PROCESS documents from FINAL documents, be sure to enter labeling information in the pull-down metadata section built into each Kepler file. The filename should be saved according to the following naming convention: <Lastname, Firstname ##.jpg>. You must login into the NJSOA network to fulfill this portion of the assignment. The guidelines described here, are in place to promote economical representations of student work and to ensure the sustainability of the Kepler system. Grossly oversized images will be deleted without notice and will not be considered for grading purposes. You must submit your PowerPoint slides as jpgs. It is good practice to keep the images at 72 dpi. You will not receive your final grade until you submit all of your assignment work to Kepler.

Attendance:
Attendance will be taken during each class and is an explicitly required component of all on-campus/location-based classes for all students in the College of Architecture and Design. After three absences students may be docked one-half grade for each subsequent unexcused absence. In other words, if the final grade would have been an "A", it results in a "B+". Similarly, a "B+" is reduced to a "B", and so on. There is a one-half grade penalty for each absence after the third. In the case of illness or other special circumstance, notification should be made through the Dean of Students office as soon as possible. The instructor has to be notified at the beginning of the semester if a student will miss a session (or more) due to religious observance. Student-athletes are required to attend all classes. A student-athlete may only miss class when representing NJIT in intercollegiate competition. No student-athlete may miss any regularly scheduled classes for any practice activities.

Tardiness:
Students are expected to arrive to class on time - classes will begin on time and it is the responsibility of the student to make up missed work.
The time limit that constitutes an absence versus tardiness is 10 minutes.

Late work:
Project assignments and digital documentation of your work are due at the beginning of class on the specified dates. Students should make every effort to avoid incomplete work and late submissions. Late submissions are not acceptable, except in the case of documented illness or special circumstances.

Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu

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Artificial Intelligence

Generative artificial intelligence has the potential to improve decision-making and enhance creativity and productivity.

While it does not have to be used in every (or any) project, it is certainly a tool that could be used to benefit under appropriate circumstances. There may be times when an instructor prohibits the use of generative AI, and times when its use is required. Follow the instructions of your teacher. However, to uphold academic integrity with the use of AI, students must consider the limitations of AI and use it critically and ethically. Be aware of the possibility of bias, incomplete and/or inaccurate information, plagiarism, and issues of data privacy. Generative AI tools can produce invalid and inaccurate information (also known as "hallucinations"). Students are responsible for any and all information or work presented that is generated in any capacity with AI tools. For graphic endeavors, students must cite the use of AI and document intermediate design steps showing text and prompts along with any images generated by AI. Tool(s) used must be cited. Do not simply copy and paste AI-generated material and claim it as your own (text or graphics). Even re-writing AI-generated output into your own words requires proper attribution. Modifications made by the designer and the way AI-generated work is used must be made clear and documented. In other words, the design and presentation processes must be documented when AI-generated work is incorporated at any step. Finally, for your own protection and to respect the privacy rights of others, do not use your personal data (including NJIT UCID), or that of others, in any prompts for AI generated material. Ever. The use of AI generative tools in design schools is in the experimental stage.

The guidelines above are based, in part, on developmental work and standards generated by the University of New South Wales in Sydney, Australia and Lawrence Technological University in Detroit, Michigan.

Accommodations for Disabilities

NJIT and instructors will endeavor to make any accommodation required and necessary for the success of students with disabilities. However, in order to receive accommodation(s), disabilities MUST be documented with NJIT Office of Accessibility Resources and Services (@njit.edu) and notification of request for accommodation must be made to the instructor by the second week of class. More information may be found at: https://www.njit.edu/accessibility/.

No accommodations can be granted "after the fact" unless due to a situation (injury/illness/etc.) that occurs or is documented during the semester. In those instances, accommodations will commence upon notification or observation of the disability. If approved for accommodation(s), it is at the discretion of the approved students whether to avail themselves of these opportunities.

Failure to utilize approved accommodations will not be considered when preparing final grades or assessments for the course. Please understand that some accommodations are publicly evident (like extended time on project presentations) and utilization of these accommodations will be seen by other students which removes any right(s) to privacy about those accommodations.

Cell Phone Policy

The use of cell phones during class time is only permitted for emergencies.