San José State University
Department of Design / Industrial Design Program
DSID 143, Section 2
Advanced Materials, Processes & Technology
Spring 2022

Instructor:	Prof. Ron Boeder
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Office Hours:	We 6:00 PM – 7:00 PM
Class Days/Time:	MoWe 3:00 PM – 5:50 PM
Classroom:	On Line
Prerequisites:	DSID 41

Canvas Course Management Website & Course Format

This course uses a hybrid method of teaching. A hybrid course means that there are components of the course that are done in the classroom and other components that require using the online course management system. Copies of the course materials such as the syllabus, assignment handouts, grading, etc. may be found on the DSID 143 course Canvas website. You may find your link to this website on MySJSU, along with your login/password info. You are responsible for regularly checking with the messaging system in Canvas for course updates, assignments, etc. All class correspondence and grading will also be managed through the class Canvas site. If you do not check Canvas often, you should set up your email forwarding to forward all class correspondence to your preferred email address. You must have access to a computer and the internet to be able to access the Canvas site. You may also use a tablet or your phone. Some assignments will be required to be turned in on Canvas, in which case you will need to have access to some basic software such as MS Office (MS Word) or some writing software, Adobe Acrobat (for making pdfs), and basic scanning software for scanning sketches to upload to the assignment portal. See University Policy F13-2 at http://www.sjsu.edu/senate/docs/F13-2.pdf for more details.

Course Description

Advanced Materials, Processes and Technology will enhance themes covered in Materials and Processes I; that all design involves the ability to be creative and forward-thinking while working with constraints and making compromises that are dictated by the 'making' processes. The course will also address the research, selection and inclusion of current, and emerging technologies in industrial design.

Course Goals:

Student Learning Objectives

While the previous course (DSID 41) focused on the most common materials and processes used in the design industry, this course will focus on the less common, more advanced and cutting-edge materials and processes, and will integrate discussions about technology and its role in the design process. It will also address the process of taking a design from initial concept through production specifications and manufacturing cost estimates. Students will identify a robot that is on the market, redesign the enclosure, and specify the materials, manufacturing processes, and CMF (Color, Material, and Finish) specifications.,

Understanding the relevance of new technologies (the difference between reality and blue sky) and their implications in the objects and services we design is key to having a greater understanding of the role of design and its myriad of applications. Students will be required to write Technology and Manufacturing reports. The reports will focus on the implications of the future direction of new materials, manufacturing processes, and technological innovations. The final project will be a detailed design for a robot concept, including the robot's function, materials specified, manufacturing processes selected, and technologies utilized.

Students will complete during the semester:

1) Weekly project assignments, and presentations taking a design from initial concept through industrial design control files ready for development of production documentation for all exterior skins. (LO 1-9)
2) Final project depicting a product design with materials and processes as primary design criteria in both high-volume and low-volume. (LO1 and LO8)
3) Reports on new or emerging technologies applicable to industrial design, and technology products. (LO5 and LO6)
4) Final presentation including new, advanced, or lesser known, materials and manufacturing processes. (LO3, LO4, and LO7)
5) Research and development of a Materials, Manufacturing Processes, and Technologies glossary of terms and acronyms. (LO2, LO6)

Course Learning Outcomes (CLO)

Upon successful completion of this course, students will be able to:

(LO1) Integrate materials and manufacturing processes into the design process.
(LO2) Identify, through research and sourcing of information, advanced materials and manufacturing processes.
(LO3) Select or recommend materials and manufacturing processes.
(LO4) Cite the rationale for selecting particular materials and manufacturing processes, in particular addressing the issue of low-volume and high-volume manufacturing, and tooling amortization.
(LO5) Employ various research methods to source information; evaluate the application and timing of integrating new and emerging technologies in product designs.
(LO6) Identify and describe advanced manufacturing processes, including emerging materials and processes such as high tech ceramics, carbon fiber, smart fabrics, photovoltaic polymers, 3D printing techniques, robotics, mass customization, and more.
(LO7) Appropriately select and specify the details of manufacturing processes, such as graphics, finishing, joining, OEM components, etc.
(LO8) Generate the details required to document and specify a design for manufacture.
(LO9) Use and articulate additional considerations in the selection of production materials and processes, including: sustainability, durability testing, EMI/RFI, regulatory issues, assembly, and shipping/packaging.

Required Texts/Readings

Textbooks: Required Reading

Lefteri, Chris. *Making It: Manufacturing Techniques for Product Design* , Third Edition (2019, Lawrence King Publishers) ISBN 978-1786273277

Thompson, Rob. *Manufacturing Processes for Design Professionals* (2007, Thames and Hudson, ISBN 978-0-500-51375-0)

Thompson, Rob. *Prototyping and Low-Volume Production (The Manufacturing Guides)*". (2011, Thames & Hudson) ISBN-13: 978-0500289181

Lefteri, Chris. *Materials for Inspirational Design.* Publisher: RotoVision (January 1, 2007). ISBN-13: 978-2940361502

Other Recommended Readings

Thompson, Rob. Sustainable Materials, Processes and Production. (2013, Thames & Hudson) ISBN-13: 978-0500290712

Dent, Andrew H, and Sherr, Leslie. *Material Innovation Product Design*. (2014, Thames & Hudson) ISBN-13: 978-0-500-29129-0

Ashby, M.; Johnson, K. *Materials and Design*, Second Edition: The Art and Science of Material Selection in Product Design, Butterworth-Heinemann; 2nd Edition (October 26, 2009) ISBN-13: 978-1856174978

Rob Thompson (Author). *Product and Furniture Design (The Manufacturing Guides).* Publisher: Thames & Hudson (April 1, 2011). ISBN-13: 978-0500289198

Materials and Design, Second Edition: *The Art and Science of Material Selection in Product Design*. Publisher: Butterworth-Heinemann; 2nd Edition (October 26, 2009). ISBN-13: 978-1856174978

Chris Lefteri. (Author). Materials for Inspirational Design. Publisher: RotoVision (March 1, 2006). ISBN-13: 978-2940361069

Chris Lefteri. (Author). Wood (Materials for Inspirational Design). Publisher: RotoVision (March 1, 2005). ISBN-13: 978-2880468125

Chris Lefteri. (Author). *Glass (Materials for Inspirational Design)*. Publisher: Rockport Publishers; 1St Edition (September 2002). ISBN-13: 978-2880465698

Chris Lefteri. (Author). *Ceramics (Materials for Inspirational Design).* Publisher: RotoVision (June 1, 2003). ISBN-13: 978-2880466688

Transmaterial 3: *A Catalog of Materials that Redefine our Physical Environment*. Blaine Brownell (Editor). Publisher: Princeton Architectural Press (February 3, 2010). ISBN-13: 978-1568988931

Rob Thompson (Author). *Graphics and Packaging Production (The Manufacturing Guides).* Publisher: Thames & Hudson; 1 edition (May 1, 2012). ISBN-13: 978-0500289884

Jim Lesko (Author). *Industrial Design: Materials and Manufacturing*. Publisher: Wiley. (August 11, 2011). ISBN-13: 978-0471297697

Jim Lesko (Author). *Industrial Design: Materials and Manufacturing Guide*.

Publisher: Wiley; 2 edition (December 14, 2007. ISBN-13: 978-0470055380

Dell K Allen (Author), Robert H Todd (Author). *Manufacturing Processes Reference Guide*. Publisher: Industrial Press, Inc.; 1st edition (January 1, 1994), ISBN-13: 978-0831130497

Michael F. Ashby (Author). *Materials Selection in Mechanical Design*, Fourth Edition. Publisher: Butterworth-Heinemann; 4 edition (October 5, 2010). ISBN-13: 978-1856176637

Raymond Guidot (Editor), Jean-Baptiste Toulard (Contributor), Jean Grenier (Contributor), Jean-Jacques Salomon (Contributor). *Industrial Design Techniques and Materials*. Publisher: Flammarion (September 5, 2006). ASIN: B005X4FBUW

Serope Kalpakjian (Author), Steven Schmid (Author). *Manufacturing Processes for Engineering Materials* (5th Edition). Publisher: Prentice Hall; 5 edition (July 27, 2007). ISBN-13: 978-0132272711

Erik Oberg (Author). *Machinery's Handbook 29th Edition - Toolbox*. Publisher: Industrial Press; 29 edition (January 2, 2012). ISBN-13: 978-0831129002

Additional readings will be available on Canvas as needed throughout the semester.

Required Materials List

Required by 2nd class session:

1) Textbooks ordered, or in-hand
2) Drawing/Rendering tools and paper
3) Digital Graphic Software (Adobe CS)
4) Digital Sketching Software (Sketchbook Pro, Procreate) Rendering
5) Microsoft Office Software or Google Suite (Student Edition)
6) SolidWorks Software (Student Edition)
7) Keyshot Rendering and Animation Software (Student Edition)

Required by last class meeting in May:

• Large format high-quality photo paper and ink, or

Recommended Materials List

• Computer capable of running Adobe Photoshop, Illustrator, and InDesign, as well as SolidWorks and Keyshot.
• Tablet PC that can use a pressure sensitive stylus recommended.

Course requirements may include attendance at various tours and outside lecture events outside of class meeting times. Some of these events [may] charge an entrance fee. If you anticipate any difficulty in meeting this course requirement, please consult with the course instructor in the first two weeks of the semester.

Shop Test

The Department of Design requires that Industrial Design students attend and pass the shop safety orientation at least once each year. We will be showing the video in class and then you will have at least a week to review the video again on your own as it is posted online (http://www.sjsu.edu/atn/services/webcasting/events/shopysafety.html) now. The shop test date will be announced the first day of class. That will be the only date that you will be able to take the shop test for this course so make sure you have studied up and paid your shop test fee at the bursars office before that date. You must provide proof of enrollment and the original receipt from the bursar's office that you have paid the required $20 shop fee to fund #62089 prior to taking the test.

Library Liaison

Gareth Scott

Email: gareth.scott@sjsu.edu

Classroom Protocol

Roll will be taken at the beginning of each class and occasionally at the end of class.

Active participation in class activities is a significant factor in a student's success in the Industrial Design program. Active learning facilitates mental growth, skill enhancement, creates a life-long learner and improves the goals of becoming a good designer. Students are expected to be on time to class and when a class critique is planned, work is to be taped/pinned up to the walls by 10 minutes after the official start of the class period. Be ready to start the critique by 10 minutes after the class officially starts. Students are to be respectful of the professor and their peers and any disruptive activities in the classroom will result in the student being asked to leave the class. Arriving late to class without prior arrangement and approval from the professor is considered disruptive. If the student cannot be in the classroom by the start of class, please do not interrupt the class in session by entering the classroom. If a student encounters any problems that inhibit their ability to participate in the class, please provide as much advance notice as possible to the instructor so that he/she may respond and inform the student in a timely manner. Students are expected to leave the classroom in a clean condition at the end of each class meeting so that the next class has an organized, clean room waiting for them.

Assignments and Grading Policy

1) Develop weekly research reports on technologies, materials, and manufacturing.

2) Complete weekly homework assignments related to final project.

3) Complete a Final Project – Design, Specification, ID Control Documentation including design specifications and CMF, and Manufacturing/Technology Research, for a designed Robot. Two versions will be designed: 1) One robot utilizing current/mature technologies, and 2) One robot utilizing new and emerging technologies. Digital and Hard-copy Presentations describing your robots will be the final deliverables.

4) Students will be engaged in lectures, project and report presentations during class meeting times and they will be assessed on engagement in those activities in their Participation grade (LO 1-9). Students will have homework assignments to do outside of class (up to 12 hours per week) that include reading, research, sketching, analysis/reports, 2D and 3D CAD. (LO 1-9). Students will be required to turn in all Research Reports at the mid-term date and present between that date and the end of the semester (LO 1-9). Students will be required to turn in and present their final project (Robot) by the second to last day of class (LO 1-9). Grading will follow the standard SJSU A-F system.

The structure of each week will typically be as follows:

Day 1: Presentation and Critique of previous week's assignment. Lecture on next weekly assignment.
Day 2: Present preliminary work on assignment. Work in class, group activity, or field trip.

Grading will follow the standard SJSU A-F system.

A+, A, A- / 100+ - 91% / Excellent (perfect, near perfect and professional level)
B+, B, B- / 90 – 81% / Above Average (A few minor imperfections and clearly above class average in quality and completeness)
C+, C, C- / 80-71% / Average (Assignment is completed at average level of quality and completeness)
D / 70-61% / Below Average (One or more parts of assignment missing. Did not follow direction. Work is below average level of quality
F / Below 61% / Failure (did not complete a significant aspect of the assignment and/or work well below average).

Grading is weighted as follows:

Class Participation / Preliminary Work (LO 1-9):	20%
Homework Projects - (LO 1-9):	60%
Final Project - Final Renderings, and Project Summary (LO 1-9):	10%
Final Project - Final Process Book for Course Project (LO 1-9):	10%

Grades for assignments will be divided evenly throughout the semester and receive equal credit, except as noted. All assignments are due on time. No late work is accepted. Assignments will be submitted to Canvas on-time. No assignments will be accepted via email. However, your final presentation will be reviewed at the end of the semester, and will be graded on completeness (so you should include all assignments, even those not previously turned in), and presentation quality. Therefore, all projects should be included in this presentation and reworked if substandard. Extra credit is not possible in this course as the regular workload is significant. A passing grade for this course is a C. The Participation grade in this course will be assessed through your engagement in presentations, critiques, videos, in-class group activities, field trips, and presenting preliminary work on the second class-day each week. Additionally, actively engaging and exhibiting life-long learning skills during class are the mode by which participation is assessed.

University Policies

SJSU's Office of Graduate and Undergraduate Programs maintains university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc. You may find all syllabus related University Policies and resources information listed on GUP's Syllabus Information Web Page at http://www.sjsu.edu/gup/syllabusinfo/.

Student Technology Resources

It is a requirement for ID students to have their own computer with the required software (Adobe CS, Solidworks, MS Office), and it is highly recommended that by the time students pass DSID 123A that all BSID students have a large format printer (11"x17" or 13"x19"). Computer labs for student use are available in the Academic Success Center located on the 1st floor of Clark Hall. Computers are also available in the Martin Luther King Library. A wide variety of audio-visual equipment is available for student checkout from Media Services located in IRC 112. These items include digital and VHS camcorders, VHS and Beta video players, 16 mm, slide, overhead, DVD, CD, and audiotape players, sound systems, wireless microphones, projection screens and monitors. The ID Program will provide access to the large format printer for critiques and presentations. Students will be given a 8 linear foot allotment of paper for this course (enough for 1 draft and 1 final print). Any additional needs for printing can be accommodated by payment through the IDSA Student Chapter or going to Plotter Pros (http://www.plotterpros.net/index.shtml) in San Jose.

Adobe Creative Suite licenses have been available through the SJSU Adobe software program for faculty, staff, and students. Students can access Adobe Creative Suite 6 Design and Web Premium, and should be able to download it from http://its.sjsu.edu/services/adobe/. Adobe Creative Suite 6 Design and Web Premium includes: Photoshop CS6 Extended, Illustrator CS6, InDesign CS6, Dreamweaver CS6,

Flash® Professional CS6, Fireworks® CS6, Acrobat® X Pro, Bridge CS6, Media Encoder CS6.

DSID 143 / Advanced Materials, Process & Technology
Spring 2022 / Course Schedule

Schedule is subject to change with fair notice (one week) in class or via notice on Canvas.

Week	Date	Topics, Readings, Demos, Assignments, Deadlines
Week 1	W 1/26	Lecture: Course Introduction Homework Assigned: All Research Report Topics (LO 1-9) Robot - Research, Target Market Persona Selection/Definition Homework Due: None Activity: Robot - Research, Target Market Persona Selection/Definition (LO 1-9)
Week 2	M 2/1 W 2/3	Lecture: Technology Research Homework Assigned: All Research Reports (LO 1-9) Robot Concept Sketches (12) (LO 1-9) Homework Due: Report Topics Activity: Research Report Development (LO 1-9)
Week 3	M 2/8 W 2/10	Lecture: Trends in Materials, Processes, and Technology Homework Assigned: Robot – Refined Concepts (3) (LO 1-9) Homework Due: Robot - Concept Sketches (12) Activity: Research Report Development (LO 1-9)
Week 4	M 2/15 W 2/17	Lecture: Low-Volume vs. High-Volume Manufacture Homework Assigned: Robot – "Final" Design orthographic views and perspective sketches (LO 1-9) Homework Due: Robot – Refined Concepts (3) Activity: Research Report Preliminary Presentations (LO 1-9)
Week 5	M 2/22 W 2/24	Lecture: Low-Volume Manufacturing Processes Homework Assigned: Robot - Low-volume Mfg Variations (3) (LO 1-9) Homework Due: Robot - "Final" Design orthographic views and perspective sketches Activity: Research Report Preliminary Presentations (LO 1-9)
Week 6	M 3/1 W 3/3	Lecture: High-Volume Manufacturing Processes Homework Assigned: Robot – High-volume Exploded View w / Prelim BOM (LO 1-9) Homework Due: Robot – Low-volume Robot Manufacturing Variations (3) Activity: Research Report Preliminary Presentations (LO 1-9)
Week 7	M 3/8 W 3/10	Lecture: OEM Components Homework Assigned: Robot – Selection and Spec of OEM Components (LO 1-9) Homework Due: Robot – High-volume Exploded View with Preliminary BOM Activity: Research Report Final Presentations (LO 1-9)
Week 8	M 3/15 W 3/17	Lecture: Fastening and Assembly Homework Assigned: Robot – Fastening and Assembly details (LO 1-9) Homework Due: All Research Reports Robot – Selection and Specification of OEM Components

		Activity: Research Report Final Presentations (LO 1-9)
Week 9	M 3/22 W 3/24	Lecture: Vendor Research Homework Assigned: Robot – Manufacturing Vendor Research (LO 1-9) Robot – Detailed Descriptions of Selected Mfg Processes Homework Due: Robot – Fastening and Assembly details Activity: Research Report Final Presentations (LO 1-9)
Spring Break	**M 3/29** **W 3/31**	**Spring Break, No Class, Campus Closed**
Week 10	M 4/5 W 4/7	Lecture: Graphics and Branding Homework Assigned: Robot – Branding (3 Variations) (LO 1-9) Homework Due: Robot – Manufacturing Vendor Research Robot – Detailed Descriptions of Selected Mfg Processes Activity: Research Report Final Presentations (LO 1-9).
Week 11	M 4/12 W 4/14	Lecture: Mechanical Drawings Homework Assigned: Robot - 2D Mechanical Drawings and Final BOMs (LO 1-9) Homework Due: Robot - Branding (3 variations) Activity: Research Report Final Presentations (LO 1-9)
Week 12	M 4/19 W 4/21	Lecture: Finishes, Color, Material Specifications Homework Assigned: Robot - Finishes (3 rendering variations) (LO 1-9) Homework Due: Robot - 2D Mechanical drawings Activity: Research Report Presentations (LO 1-9)
Week 13	M 4/26 W 4/28	Lecture: None Homework Assigned: Robot - Final Renderings (LO 1-9) Homework Due: Robot - Finishes (3 rendering variations) Activity: Research Report Final Presentations (LO 1-9)
Week 14	M 5/3 W 5/5	Lecture: Presentation Techniques Homework Assigned: Robot - Digital Renderings PDF Files (LO 1-9) Homework Due: Robot - Final Renderings Activity: Research Report Final Presentations (LO 1-9)
Week 15	M 5/10 W 5/12	Lecture: None Homework Assigned: None Homework Due: Robot - Digital Renderings Activity: Research Report Final Presentations (LO 1-9)
Week 16	M 5/17	Lecture: None Homework Assigned: None Homework Due: Robot - Digital Renderings Activity: Research Report Final Presentations (LO 1-9)
Final Exam	Tu 5/24	***Final Exam: Tuesday 5/24/21, 12:15 – 14:30***