

San José State University
Department of Design / Industrial Design Program
DSID 126, Ergonomics for Design
Section 01, Spring 2022

Instructor:	Professor Ron Boeder
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Office Hours:	Thu 6:00 PM - 7:00 PM
Class Days/Time:	Tue/Thu 3:00 PM - 5:50 PM
Classroom:	Art 103 (Online Zoom Meetings until 2/14/22)
Prerequisites:	DSID 22; DSID 32

Canvas Course Management Website

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 126 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 Internet to be able to access the Canvas site. You may also use a tablet or your phone. All assignments will be required to be turned in both in class on paper and on Canvas. Therefore 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](http://www.sjsu.edu/senate/docs/F13-2.pdf) at <http://www.sjsu.edu/senate/docs/F13-2.pdf> for more details.

Introduction

“We bear in mind that the object being worked on is going to be ridden in, sat upon, looked at, talked into, activated, operated, or in some way used by people individually or in mass.

When the point of contact between the product and the people become a point of friction, then the industrial designer has failed.

On the other hand if people are made safer, more comfortable, more eager to purchase, more efficient----or just plain happier---by contact with the product, then the designer has succeeded.”

– *Henry Dreyfuss*

Big Idea: There are key ergonomic issues that must be addressed by designers to ensure the most acceptable levels of safety, performance, comfort and ease of use for all products. Topics include, physical controls, computer interfaces, visual displays, other sensory interfaces, anthropometry, seating design, furniture, automobiles, and safety design.

Course Description

Ergonomics in Design is an introductory course that introduces students to a key principle of design –“human factors” – that impact product design and use. This course covers ergonomic issues as they pertain to product design and development. We will cover these issues through a combination of lectures, classroom discussions and group activities, and individual projects. The concepts and information for the course will be obtained in assigned readings, lectures, design assignments, hand-outs and classroom discussions. Your knowledge of the concepts and information covered will be evaluated according to how successfully you can discuss the topics in class and apply the materials on projects assignments.

The course aims to equip students to investigate human-use implications of their design activities with regard to issues such as usability, comfort, efficiency and safety. Project work and lectures will focus on human factors/ ergonomics principles and research methods and their application in Industrial Design and product development.

Learning activities build up on work carried out in previous Industrial Design courses, and are intended to increase students understanding of the complexities of design practice. Projects allow students to gain further experience in applying research and design methodologies to solve problems of moderate complexity. Each assignment has a strong emphasis on innovation, technical resolution and documentation to a professional standard. A rigorous and responsible approach to product design is fostered through working on projects with "real-world", commercial, environmental, technological or industrial constraints.

On Tuesday of each week, there will be a lecture on an ergonomic topic (which may include videos or demonstrations), readings will be assigned, examples of previous student work will be shared, and Assignments and Notebook Assignments from the previous week will be due. With any remaining class time, you will have time to work on your projects, and meet with your professor.

On Thursday of each week, you will present your progress on your weekly assignment for a Participation Grade. With remaining class time, you will be in breakout sessions, and you will have time to work on your projects, and meet with your Professor.

There will be four major projects during the semester: 1) The Ergonomic Design of a Utility Knife, 2) The Ergonomic Design of a Remote Control, 3) The UI of a mobile app and full-size screen interface, and 4) The Design of a Bank ATM.

Your Final Projects will be: 1) Your Final Notebook, 2) Your Final Process Book, and 3) Your Final Projects Book.

Course Goals and Student Learning Objectives: Student Learning Objectives

- Demonstrate the relevance & importance of ergonomics in society and industry.
- Highlight how to recognize and identify human factors problem.
- Use foundational research methodologies such as 1x1 interviews, ethnography etc.
- Consider and integrate ergonomic and anthropometric information into design concepts.
- Increase student interest and awareness of the importance of ergonomic issues in everyday things and actions in physical and mental work.
- Use drawing and rendering to effectively communicate and explore design intent.
- Communicate a written design proposal in a succinct manner using hand sketches, 3D form studies, including supporting data and graphs as required.
- Apply and articulate a practical design methodology and process to design projects.
- Generate physical artifacts to demonstrate and evaluate design solutions.
- Apply knowledge of science, technology and industrial design principles.
- Be able to critically identify and analyze design problems from user and consumer perspective.
- Apply creativity and technical aspects in product design.
- Adapt to a changing design situation, taking into consideration the cultural, political and environmental aspects of a project.
- Be able to carry out a duty with sensitivity and awareness of user safety, environment and special needs people.
- Students should be able to use software applications (e.g., MS Office Suite and Adobe Creative Suite) to prepare documents and data as well as make highly informative, multimedia presentations.
- Students should also be able to use basic measurement tools and fabrication equipment.

Course Learning Outcomes (CLO)

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

- (LO1) Demonstrate an ability to design and analyze consumer products, user interactions and environments.
- (LO2) Develop, execute, and document quantitative test procedures for design evaluations and recommendations.
- (LO3) Identify and analyze problems from a consumer perspective in order to satisfy the needs of the customer.
- (LO4) Apply creativity and technical ability in product design.
- (LO5) Organize and manage product design projects.
- (LO6) Produce visual presentation materials and present technical report.
- (LO7) Communicate effectively with co-workers, user, and customer.
- (LO8) Demonstrate professional ethics and moral responsibility in design practice.
- (LO9) Adapt to changing design situation taking into consideration the cultural, political, and environmental aspects of a design project.
- (LO10) Evaluate and use new technology.

- (LO11) Design with sensitivity and awareness towards safety, the environment, and consideration of people with special needs.
- (LO12) Discuss, critique, and engage in professional review of theirs and their peers work.
- (LO13) Use anthropometric data in design solutions.
- (LO14) Identify human factors problems.
- (LO15) Use check-lists and descriptor lists as basis of research & survey techniques.
- (LO16) Prepare ergonomics analysis reports.

Required Texts/Readings

There are three textbooks required for this course, they are available at the SJSU bookstore or www.amazon.com.

The textbooks are:

Human Factors and Ergonomics Design Handbook, by Barry Tillman, Peggy Tillman, Rhonda Renee Rose, and Wesley E. Woodson, Third Edition 2016, McGraw Hill, ISBN 978-0-07-170287-4

The Measure of Man and Woman: Human Factors in Design. Wiley, 2001. ISBN-13: 978-0471099550

The Design of Everyday Things: Revised and Expanded Edition, by Don Norman, Basic Books, Revised Edition, November 5, 2013, Basic Books, ISBN 978-0465050659

Selected reading of following books, and additional handouts will be available on Canvas “files”:

Other Recommended Readings include:

Ergonomics: Foundational Principles, Applications, and Technologies (Ergonomics Design and Management : Theory and Applications) by Pamela McCauley-Bush (Hardcover - December 13, 2011)

Bridger,R. *Introduction to Ergonomics*, Third Edition, CRC press 2009. ISBN 978-0-8493-7306-0

Buxton, Bill. *Sketching User Experiences: Getting the Design Right and the Right Design*, Morgan Kaufmann, 2007. ISBN-13: 978-0123740373

Kroemer, Karl et. al. *Ergonomics: How to Design for Ease and Efficiency* (Second Edition). Upper Saddle River, NJ: Prentice Hall, 2001.

Sommer, Barbara, and Sommer, Robert. *A Practical Guide to Behavioral Research: Tools and Techniques* (Fifth Edition). New York, NY: Oxford University Press, 2001.

Required Materials List

During the course of the class there will be four projects assigned, each requiring various prototype/modelmaking supplies and tools. Material requirements are unique to each design project. Students can expect to spend between \$150-400 on their projects, depending upon materials and tools that they may already possess.

Depending on projects, materials may include “blue foam”, Foam-Core, plastic sheets, urethane foam blocks, matte board, cardboard, spray mount, glue, tape, and painting supplies. Tools will include hand tools (due to lack of SJSU shop access), such as cutting knives and saws, hot wire cutter, cutting mat, straight edge, circle guide, ruler, compass, etc.

Shop Test

The Department of Design requires that Industrial Design students attend and pass the shop safety orientation at least once each year. There is a video that will be shown in the shop on the day of the test. You should review this video on your own prior to the day of the shop test as it is posted online:

(<http://www.sjsu.edu/atn/services/webcasting/events/shopysafety.html>) 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 bursar's 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

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 15 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.

Cell phones, organizers, laptops are also disruptive and inconsiderate to your classmates and instructors. ***Phones are NOT permitted to be on in this class*** and you will be asked to turn off and surrender your phone at the start of each class. If you disrupt or withdraw from class activity and are unable to silence your devices, it will count against the participation portion of your final grade (LO 12). If personal issues (family, medical, etc) require you to leave your phone on, you may do so by making arrangements with the instructor in advance.

Assignments and Grading Policy

Grading will follow the standard SJSU A-F system.

A+, A, A- / 100+ - 91% / Excellent
 B+, B, B- / 90 – 81% / Above Average
 C+, C, C- / 80-71% / Average
 D / 70-61% / Below Average
 F / Below 61% / Failure

Grading Rubric:

Ergonomics and Usability of the Design Solution	40%
Presentation Thoroughness / Detail / Appropriateness	40%
Presentation Quality	20%

Grading is weighted as follows:

Projects (4)	60%
Notebook Assignments / Research	10%
Participation / In-class Activities	10%
Final Notebook	10%
Final Process Book (Projects)	10%

All assignments are due on time. No late work is accepted. A passing grade for this course is a D- though the Industrial Design program requires a 3.0 to graduate in the major. The Participation grade in this course will be assessed through your engagement in Work/Practice sessions, assignment pin-ups, class discussions and critiques. Actively engaging 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](http://www.sjsu.edu/gup/syllabusinfo/) 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. Solidworks is also provided by SJSU for no cost to students. Please contact your advisor to get the downloading information.

DSID 126 / Ergonomics in Design, Section 01, 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
1	R 1/27	<ul style="list-style-type: none"> • Lecture: Review of syllabus, course content, assignment structure, course expectations, present project objectives and opportunities, materials requirements. Define Ergonomics and Associated Terms. • Assignment: A1 – Utility Knife Usage Storyboard • Participation Assignment: Textbook and Materials Procurement • Notebook Assignment: NA1 – Define Ergonomics and Associated Terms
2	T 2/1	<ul style="list-style-type: none"> • Lecture: Design Thinking, and the Ergonomic Development Process • Assignment: A2 – Market Survey, Defining, Describing Your Knife, and Orthographic Views (Drawings or Photos) • Notebook Assignment: NA2 - Define Design Thinking, User Experience, and the Ergonomic Development Process
	R 2/3	<ul style="list-style-type: none"> • Assignment: A3 – Foam Mock-up of your Existing Knife • Participation Assignment: Present Assignment Work in Progress, and
3	T 2/8	<ul style="list-style-type: none"> • Lecture: Anthropometry /Anthropometrics • Assignment: A4 – Conduct Tests, Observations, and Interviews • Notebook Assignment: NA3 – Define Anthropometry /Anthropometrics
	R 2/10	<ul style="list-style-type: none"> • Assignment: A5 – Create Orthographic View Drawings for Five (5) Utility Knife Designs (your own designs) • Notebook Assignment:
4	T 2/15	<ul style="list-style-type: none"> • Lecture: Fabricating a Blue Foam mock-up • Assignment: A6 – Create Five (5) Mock-ups Using your Orthographic View Drawings • Notebook Assignment: NA4 – Describe the Process of Fabricating a Blue Foam mock-up • Assignment Due:
	R 2/17	<ul style="list-style-type: none"> • Assignment: A7 – Test and Evaluate the Five Utility Knife Concepts • Notebook Assignment: • Assignment Due:
5	T 2/22	<ul style="list-style-type: none"> • Lecture: Guidelines for the Ergonomic Design, Dimensions, and Selection of Tools • Assignment: A8 – Final Utility Knife Mock-up • Notebook Assignment: NA5 – Describe the Guidelines for the Ergonomic Design, Dimensions, and Selection of Tools
	R 2/24	<ul style="list-style-type: none"> • Assignment: A9 – Final Design Concept Description • Notebook Assignment: NA6 – Handle Design

6	T 3/1	<ul style="list-style-type: none"> • Lecture: Control Selection and Design Considerations • Assignment: A10 – Final Project/Process Book for Ergonomic Tool Design – Utility Knife • NA7 – Control Selection and Design Considerations
	R 3/3	<ul style="list-style-type: none"> • Assignment: A11 – Evaluating an Existing Product – Document all the Functions of your Reference Remote Control
7	T 3/8	<ul style="list-style-type: none"> • Lecture: Key Considerations in the Design of Remote Controls • Assignment: A12 – Design an Ergonomic Remote Control / Big Control Panel • Notebook Assignment: NA8 – Summarize the Key Considerations in the Design of Remote Controls
	R 3/10	<ul style="list-style-type: none"> • Assignment: A13 – Remote Control Empathy Experiments; Experience and observation • Notebook Assignment: NA9 – Summarize App and GUI Design
8	T 3/15	<ul style="list-style-type: none"> • Lecture: Wireframing Process for a Mobile App • Assignment: A14 – Remote Control Concept Sketches • Notebook Assignment: NA12 – Describe Adobe XD Software Wireframing and Testing
	R 3/17	<ul style="list-style-type: none"> • Assignment: A15 – Revised / Refined Concepts • Lecture: Wireframing Process for a Mobile App • Notebook Assignment: NA10 – Describe the Wireframing Process for a Mobile App
9	T 3/22	<ul style="list-style-type: none"> • Assignment: A16 – Remote Control Base Mock-up, and 2D+ Control Panel Variation Mock-ups, A17 – Remote Control Concepts: Test, Observe, Interview • Lecture: Heuristics in App Design • Notebook Assignment: NA11 – Describe Heuristics in App Design
	R 3/24	<ul style="list-style-type: none"> • A18 – Final Remote Control Designs (2) • Lecture: Heuristics in App Design • Assignment: NA11 – Describe Heuristics in App Design
10 No Class Spring Break	T 3/29	<ul style="list-style-type: none"> • No Class Spring Break
No Class Spring Break	R 3/31	<ul style="list-style-type: none"> • No Class Spring Break

11	T 4/5	<ul style="list-style-type: none"> • Lecture: Describe Adobe XD Software Wireframing and Testing • Assignment: A19 – Final Project/Process Book for Controls Design – Remote Control • Notebook Assignment: NA12 – Describe Adobe XD Software Wireframing and Testing
	R 4/7	<ul style="list-style-type: none"> • Assignment: A20 – Preliminary Existing Wireframe for Mobile Banking App
12	T 4/12	<ul style="list-style-type: none"> • Lecture: Ergonomic Issues and Considerations Related to Self-Service Kiosk Design • Assignment: A21 – Preliminary Existing Payment App Wireframe • Notebook Assignment: NA13 – Describe the Ergonomic Issues and Considerations Related to Self-Service Kiosk Design
	R 4/14	<ul style="list-style-type: none"> • Assignment: A21 – Preliminary Existing Payment App Wireframe
13	T 4/19	<ul style="list-style-type: none"> • Lecture: Ergonomic Design for Persons with Disabilities • Assignment: A22 – Final Mobile Banking App Wireframe (Existing App) • Notebook Assignment: NA14 – Ergonomic Design for Persons with Disabilities
	R 4/21	<ul style="list-style-type: none"> • Assignment: A22 – Final Mobile Banking App Wireframe (Existing App)
14	T 4/26	<ul style="list-style-type: none"> • Lecture: Visual Displays, Labels, and Legends • Assignment: A23 – Wireframe of YOUR Mobile App Concepts Combining Traditional Banking with Peer-to-Peer Payment • Notebook Assignment: NA15 – Visual Displays, Labels, and Legends • Assignment Due:
	R 4/28	<ul style="list-style-type: none"> • Assignment: A24 – Describe how you will address each of the Heuristics for your Mobile App
15	T 5/3	<ul style="list-style-type: none"> • Lecture: Fabricating Large Mock-ups • Assignment: A25 – Final Wireframe, Graphic Design and Heuristics for Your Mobile App • Participation Assignment: NA16 – Fabricating Large Mock-ups
	R 5/5	<ul style="list-style-type: none"> • Assignment: A26 – Mobile App Test, Observe, Interview – Please Read Adobe XD Option, A27 – Mobile App UI/UX Final Process Book • Participation Assignment: • Notebook Assignment: • Assignment Due:
16	T 5/10 R 5/12	<ul style="list-style-type: none"> • Lecture: None • Assignment: A28 – ATM Ergonomic Research and Observation • Final Notebook, Final Process Book, Final Project Book • Participation Assignment: None

		<ul style="list-style-type: none"> • Notebook Assignment: Final Notebook • Assignment Due:
Final Exam	W 5/18 2:45 – 5:15	<ul style="list-style-type: none"> • Lecture: None • Assignment: None • Participation Assignment: None • Notebook Assignment: None • Assignment Due: Final Process Book, and Final Project Book • Notebook Assignment Due: Final Notebook • Participation Assignment Due: Present Project Book