San José State University
Department of Design / Industrial Design Program
DSID 126, Ergonomics for Design
Section 02, Spring 2022

Instructor:	Professor John Guenther
Office Location:	Art 113 (Zoom meetings until notified)
Telephone:	(831) 214-2309
Email:	john.guenther@sjsu.edu
Office Hours:	Thursday 2:00pm-3:00pm
Class Days/Time:	Tuesday-Thursday 3:00am-5:50am
Classroom:	Art Building – Room 205 (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 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 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 computer interfaces, visual displays, anthropometry, seating design, furniture, automobiles, hand held devices, tools, appliances, safety design as well as others.

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 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 be able 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 but not limited to work 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.

There will be one primary project assigned during the semester that will be structured in two phases beginning with a digital functional analysis exercise that will provide the opportunity to evaluate existing digital information technology culminating with the assignment to make improvements based on sound ergonomic principles discussed in class and reading material. Using the same product focus, the final assignment will be to do a functional analysis of the chosen hardware product culminating with a re-design of the product based on sound ergonomic principles. Teams will be formed to do peer-reviews of each student's project progress, quality of content and decisions.

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. They also will be on-line on Canvas in the "files" section for this course.

The textbooks are:

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

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

Selected reading of following textbook will be available on Canvas "files":

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

There will be additional handouts of reading material distributed in class.

Other Recommended Readings include:

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.

Norman, Donald A. *The Design of Everyday Things.* New York, NY: Basic Books, 2002.

Required Materials List

Projects:

During the course of the class a two phased project will be assigned requiring various prototype/modelmaking supplies. Material requirements are unique to each design project and dependent on assignment chosen. Students can expect to spend between $150-400 on their project, depending upon the nature of their solution.

Depending on projects, materials may include Foam-Core, acrylic plastic sheets, urethane foam blocks, wood, Modulan foam and painting supplies.

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 defines the safety and shop use. You should review this video on your own as it is posted online: (http://www.sjsu.edu/atn/services/webcasting/events/shopysafety.html)
Since the Spring 2021 semester will be taught on-line, the students will be required to view the video and confirm to the professor that they have done that.

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 prepared to be shared in the on-line class session and be prepared prior to 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 quietly. 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.

Cell phones, organizers, laptops are also disruptive and inconsiderate to your classmates and instructors. ***Phones are NOT permitted to be on in this class*** unless you are using a phone to participate in the on-line class session. 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 evaluation (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

Assignments are defined in the "assignments" section of the class section in Canvas and are a mixture of in-class participation such as pin ups and presentation of work that shows progress on the assignment, document turn in's in class and both class presentations and uploads to Canvas. All assignment deliverables (1-7) are to be uploaded to Canvas as a PDF file.

The rubrics that will be used to determine grades of deliverables will include comparisons to previous classes levels of the quality and quantity of deliverables and compared to the

student's current peers in their class. This will be based on the judgment of the professor. An A grade shows that a student has gone far beyond what was required in the assignment such as considerably more concepts explored, additional mockup explorations, the development of prototype experiments to prove concepts etc. A B grade shows that a student exceeded the expectations of the assignment requirements with additional development and explorations than was asked for. A C grade means that the student achieved the expected requirements of the assignment and was successful in meeting the requirements of the assignment. A D grade indicates that the student failed to meet all of the requirements of the assignment but was able to submit the assignment on time. The quality of execution, thinking or amount of work was insufficient. An F grade indicates that the student failed to deliver the assignment by the deadline required or the content was inadequate.

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 of the assignments are weighted as follows:		Due
#1 Digital Protocol Plan	10%	2/10/22
#2 Digital Redesign Presentation	20%	3/1/22
#3 (3) Concept Directions, Test Protocol	10%	3/15/22
#4 Single Direction Refined Design	15%	3/22/22
#5 Test Plan Results/Refinements Presentation	10%	4/19/22
#6 Final Project Review and Process Book	25%	5/10/22 -5/12/22
#7 Final Project Test Prototype	10%	5/10/22 - 5/12/22

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. Your participation 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 and this evaluation will be a factor in determining the final grades for the course.

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. 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 02, 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	TH 1/27	• Review of syllabus, course content, assignment structure, course expectations, present project objectives, opportunities, and materials requirements. • Outline project assignment: research and select 3 potential products • First reading assignment: (Chapter 1, Introduction, Bridger – Canvas) • View shop test video and send email to professor confirming viewing.
2	T 2/1	• General HF / Ergo lecture; *The Designer's Role*. • Discuss reading material • Individual summary **presentation** of products the student would like to propose (3) with feedback from professor and class.
	TH 2/3	• **Presentation** (5 min) by students on their choice for (1) digital web site analysis. Class to provide comments for the student presentations. • Lecture: *Developing digital analysis protocol and test plan* • Reading assignment: (Chapter 1&2, Introduction, McCauley)
3	T 2/8	• Lecture: *Website design, protocol analysis/testing plans* • Student 1/1 review with professor on progress or their web site analysis • Reading assignment: (Chapter 14 & 15, Bridger)
	TH 2/10	• Lecture: *Task performance analysis of digital tools* • **Assignment #1** - Student **Presentation** of Digital Project Analysis Protocol Plan (5 min) • **Upload to Canvas** - Digital Project Analysis Protocol Plan document
4	T 2/15	• Planned on Campus/in class Lecture: *Human Factors and Aesthetics* • Teams assigned and meet for digital evaluation review assignment.
	TH 2/17	• Lecture: *Senses of the Human Body & Environmental Factors*. • Reading: to be assigned • Teams meet in assigned groups during class and review each other's student proposals.
5	T 2/22	• Lecture: *Human error vs. Design error / Bad Design* • **Quiz #1** on reading material to date. • Class summary **presentations** on progress (5 min).

	TH 2/24	• Lecture: *User Experience Design/Ergonomics dependencies.*
		  • Discussion: class discoveries/issues with digital analysis assignment.
		  • Update **presentations** on validation with stakeholders. (5 min)

6	T 3/1	• **Assignment #2** - **Presentation** of student digital analysis redesign proposal. (5 min) presentation with critique and recommendations. • **Turn in to class digital analysis process booklet. Upload to Canvas** PDF of digital analysis redesign proposal booklet documentation. • Reading assignments: to be assigned
	TH 3/3	• Hardware ergonomics assignment introduced and discussed. • Lecture: *Design of Workplaces & Hand tools.* Reading: to be assigned • Work in class teams on project action plan and begin exploring concepts for hardware improvement evaluation.
7	T 3/8	• Lecture: *Work related Musculoskeletal Disorders.* • Discussion: Research Product criteria & usage, current market landscape, analyze competitive & similar product categories & system, develop user persona. • Student **presentation** summary of hardware project action plan. Class and professor feedback.
	TH 3/10	• Team meetings in class to review and discuss findings & proposed product direction to date. Discuss ideas with Professor. • Type of work tasks, user persona, workflow, etc. • Commence concept exploration & idea development. Begin work on creating 25 Concept Sketches for review next class
8	T 3/15	• **Assignment #3** - **Presentation** (5 min) of top 3 variation sketches of each (3) concept directions (9 sketches) selected from 25 sketches. • **Upload to Canvas** PDF of 25 sketches, 9 variation sketches, project criteria & Ergonomic requirements, workflow, test validation & evaluation protocol including test model definitions.
	TH 3/17	• Class **presentation** (5 min)- selection of single direction. • Discussion: Format and requirements for Tuesday's preliminary design summary documentation. • Begin preliminary mockup construction for testing of single direction
9	T 3/22	• **Assignment #4** - **Upload to Canvas** PDF documentation of refined design concept sketches, design development, scaled orthos (exterior & components layout), anthropometric dimensioning, materials & color rational etc.
	TH 3/24	### *Hardware Project Presentation:* present test mockup and testing protocol plans
10	T 3/29	### *Spring Break - Campus Closed*
	TH 3/31	### *Spring Break - Campus Closed*

11	T 4/5	• Lecture: *Persona - Methods to Produce Focused Consumer needs* • Reading assignment: to be assigned
	TH 4/7	• In class discussion of individual findings & experiences • Reading assignment: to be assigned • Anthropometric data-hand out Continue user testing •Teams meet to review student's progress of research, user-interviews, testing, validation and synthesis of design improvement opportunities.
12	T 4/12	• **Quiz #2** on reading assignments, Open Class Discussion • Continue to develop and refine testing mockups and test users.
	TH 4/14	• Lecture Topic TBD *(Needs Analysis & validation)* • 1/1 review of student project progress.
13	T 4/19	• **Assignment #5** – **Refinement Presentation** (5 minutes). Student to structure team review recommendations, initial user testing results/findings and define proposed final design refinements. **Upload to Canvas** – PDF of class presented slide deck of complete design summary improvement strategy.
	TH 4/21	• Each student revise design proposal based on critique input/user tests. Begin construction of final test prototype build
14	T 4/26	• Work on mockup/prototype build • 1x1 with Instructor as needed
	TH 4/28	• **Presentation** progress report (5 min) • Work on finished build- physical mockup/prototype/model.

15	T 5/3	• Individual student consultations -work in progress to be reviewed • Review Material for content & Length of Presentation • Continue final validation tests and interviews
	TH 5/5	• 1/1 reviews as needed, conduct final validation interviews
16	T 5/10	• Assignments 6&7 -**Final Presentations** (digital) &model – Group A. **All students turn in process books in class and upload PDF document to Canvas**. Class Participation critique & Discussion.
17	TH 5/12	• Assignments 6&7 - **Final Presentations** (digital) &model – Group B