

**San José State University**  
**Aviation and Technology Department**  
**Tech 140, Sustainable Product Design, Section 01/11/12, Fall, 2019**

**Course and Contact Information**

Instructor:	Dr. David P. Yan
Office Location:	IS 101
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Email:	david.yan@sjsu.edu
Office Hours:	Thursday: 10:00AM - 12:00 PM; (and by Arrangement)
Class Days/Time:	Wednesday: 9:00AM - 11:45 AM (Laboratory, Section 12) Thursday: 3:00PM – 4:45 PM (Lecture, Section 01) Thursday: 6:00 PM – 8:45 PM (Laboratory, Section 11)
Classroom:	E103 for lecture, and E103/IS117 for section 11/12 lab activities
Prerequisites:	Me/Tech 020, Chem. 001A or Chem. 030B, Math 071 or Math 030 or Math 030P

**Course Format**

**Technology Intensive, Hybrid, and Online Courses**

Laboratory: E 103 is not an “open” lab and is not available except during the periods assigned to this class. An open computer lab is located on the 4th floor of the Engineering building, E 405. Get registered and use it!

**Course Description**

Advanced product design employing 3D modelling technique. Measure environmental impacts of designs focusing on materials, manufacturing, product use and disposal. Projects based learning incorporating design intent, materials selection and advanced manufacturing technologies. Laboratory exercises for product design, development and fabrication.

**Course Learning Outcomes (CLO)**

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

1. Create complex SolidWorks assemblies and demonstrate 3D solid modeling skills in product design
2. Perform materials selection technique in environment-friendly product design
3. Design and employ sustainable manufacturing processes for fabricating products
4. Integrate product design, materials selection and product manufacturing into the design, development and manufacturing of new products

## Required Texts/Readings

### Textbook

1. Planchard, D. C. (2018). Engineering Design with SolidWorks 2018 and Video Instruction: A Step-by-Step Project Based Approach Utilizing 3D Solid Modeling. SDC Publications, ISBN-13: 978-1630571474, Available at Spartan Book Store
2. Groover, M. (2019). Fundamentals of Modern Manufacturing: Materials, Processes, and Systems (7th Ed.). Wiley, ISBN-13: 978-111947521-7R150 (E book), Available at Wiley, 978-1119592792 (Loose-leaf), Available at Spartan Book Store

### Other Readings

1. Ashby, M. F. (2017). Materials Selection in Mechanical Design (5th Ed.). Butterworth-Heinemann, ISBN-13: 978-0081005996

### Other technology requirements / equipment / material

1. [Student Edition of 2018-2019 SolidWorks CAD software](#) (contact your instructor for School License ID Code for a free download when available)
2. A minimum of 8 gigabyte flash drive
3. Safety glasses
4. A scientific calculator with trig functions
5. Project fabrication materials which cannot be provided in class or lab

## Course Requirements and Assignments

### 1. Assignments (25%)

There will be four SolidWorks-based design assignments (i.e. Assignment 1-4, each is worth 3% of the course grade) which students will undertake during lab time, one Materials Selection Study (i.e. Assignment 5, worth 5% of the course grade) selected from the “Materials Selection in Mechanical Design”, one Research Paper related to Solid State Joining Technology (i.e. Assignment 6, worth 4% of the course grade), and two end-of-chapter problems assignments (i.e. Assignment 7 and 8, each is worth 2% of the course grade) from the “Fundamentals of Modern Manufacturing: Materials, Processes, and Systems”.

The objective is to comprehensively familiarize students with SolidWorks commands, features, functionalities, as well as engineering materials selection, and modern manufacturing processes and systems including advanced Solid State Joining Technology. These assignments will be given on a weekly, bi-weekly or three-week basis and are due during the second week of each assignment as scheduled. Students must show sufficient evidence that they are the ones doing the designs and their associated reports. Late assignments will not be accepted unless the student has a valid university excuse.

### 2. Projects (30%)

There will be two New Product Design, Development and Manufacturing Projects which will be done in group of 5-6 students during lab time. Each project is worth 15% of the course grade. Each group should choose one from the list below as the first group project:

(1) Chair design project or Appliance design project – Select one design project from the following options: Chair, bar stool, lounge chair, Small kitchen appliance such as blender, can opener, mixer, a small power tool such as drill, circular saw, or sander.

(2) Mechanical product design project – Mechanism design; Designing or redesigning a manual can crusher, an automatic can crusher, or wind turbine.

(3) Modular Concept Car Design – This project requires that a 2-person car be designed using the criteria that will be prescribed.

The second group project will be focused on design and fabricating lightweight panels/containers using advanced solid-state joining techniques and including the following components:

(1) Design solid-state joining tools, joining fixtures and fabricating conditions.

(2) Joining 6061-T651 Aluminum plates (Thickness around 0.125" to 0.25") for lightweight panels/containers application. More information will be provided about these two projects.

### 3. Mid-Term Exam (14%)

There will be one mid-term exam in this class. The mid-term will be scheduled approximately mid-way in the semester (see the class schedule). Mid-term exam will constitute 14% of course grade. More information will be provided about this exam.

### 4. Participation in Class and Group Work (6%)

There must be sufficient evidence that each student is participating in class activities. This is evidenced by the amount of time students spend in class working on their course-related assignments, projects, group work, participation in discussions, completing assignments and such likes.

“Success in this course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally three hours per unit per week) for instruction, preparation/studying, or course related activities, including but not limited to internships, labs, and clinical practica. Other course structures will have equivalent workload expectations as described in the syllabus.”

### Final Examination or Evaluation

#### 5. Final Exam (25%)

The final exam will be scheduled by the university on **Friday, December 13 from 07:15-09:30**. Also see the following links <http://info.sjsu.edu/static/catalog/final-exam-schedule-fall.html> The final exam will be comprehensive. More information will be provided about this exam.

### Grading Information

Your grade will be based on your performances in the assignments, projects, mid-term exam, participation in class and group work, quizzes and final exam. The following items and percentages are used to determine your course grade:

Item	Number of items evaluated	Total Percentage
Assignments	8	25
Projects	2	30
Mid-Term Exam	1	14
Participation in Class & Group	1 & 1	6
Final Exam	1	25
Total		100

## Determination of Grades

A plus	96 to 100%
A	93 to 95%
A minus	90 to 92%
B plus	86 to 89 %
B	83 to 85%
B minus	80 to 82%
C plus	76 to 79%
C	73 to 75%
C minus	70 to 72%
D plus	66 to 69%
D	63 to 65%
D minus	60 to 62%

## Classroom Protocol

Please arrive on time for the class and silence your cell phones during the class period. The homework assignments will be collected at the very start and end of class. If you are late to the class, please hold your assignments to pass in at the end of the class (it is disruptive when students walk up to hand in assignments during the class).

## University Policies

Per University Policy S16-9, relevant information to all courses, such as academic integrity, accommodations, dropping and adding, consent for recording of class, etc. is available on Office of Graduate and Undergraduate Programs' [Syllabus Information web page](http://www.sjsu.edu/gup/syllabusinfo/) at <http://www.sjsu.edu/gup/syllabusinfo/>

# Tech 140-01 / Sustainable Product Design, Fall 2019, Course Schedule

(Schedule is subject to change with notice)

## Course Schedule

Week	Date	Topics (lecture contents)	Readings, Assignments, Deadlines
1	Aug. 22 (Thursday)	<ol style="list-style-type: none"> <li>1. Orientation to the class</li> <li>2. Discuss on course goals, logistics, grading, expectations, syllabus, assignments, projects, participation in class &amp; group, and exams</li> <li>3. Introduction and SolidWorks User Interface</li> <li>4. Assignment 1</li> </ol>	<p>All readings are from the required texts:</p> <ol style="list-style-type: none"> <li>1. Planchard, D. C. (2018). Engineering design with SolidWorks 2018 etc., i.e. PD</li> <li>2. Groover, M. (2019). Fundamentals of modern manufacturing etc., i.e. GM</li> <li>3. Ashby, M. F. (2017). Materials selection in mechanical design (5th Ed.), i.e. AM</li> <li>4. Outside Materials provided in class</li> </ol> <p>Readings:</p> <ol style="list-style-type: none"> <li>1. PD: Project 1 (Page 1-36)</li> </ol>
2	Aug. 29	<ol style="list-style-type: none"> <li>1. Fundamentals of 3D Part Modeling</li> <li>2. Fundamentals of 3D Assembly Modeling</li> <li>3. Intro. to the 1st Design Project</li> <li>4. Assignment 2</li> </ol>	<ol style="list-style-type: none"> <li>1. PD: Project 2 (Page 1-90)</li> <li>2. PD: Project 3 (Page 1-80)</li> </ol>
3	Sep. 5	<ol style="list-style-type: none"> <li>1. Fundamentals of Drawings</li> <li>2. Extrude and Revolve Features</li> <li>3. Assignment 3</li> </ol>	<ol style="list-style-type: none"> <li>1. PD: Project 4 (Page 1-78)</li> <li>2. PD: Project 5 (Page 1-84)</li> <li>3. Assignment 1 Due</li> </ol>
4	Sep. 12	<ol style="list-style-type: none"> <li>1. Green Design with SolidWorks</li> <li>2. Additive Manufacturing 3D Printing</li> <li>3. Materials Selection—Case Studies I</li> <li>4. Assignment 4</li> </ol>	<ol style="list-style-type: none"> <li>1. PD: Project 10 (Page 1-31)</li> <li>2. AM: Ch. 6.1, 6.2, 6.3</li> <li>3. Outside Materials provided in class</li> <li>4. Assignment 2 Due</li> </ol>
5	Sep. 19	<ol style="list-style-type: none"> <li>1. Materials Selection—Case Studies II</li> <li>2. Overview of Material Properties and Product Attributes</li> <li>3. Assignment 5</li> </ol>	<ol style="list-style-type: none"> <li>1. AM: Ch. 6.4, 6.5</li> <li>2. GM: Ch. 2.5, Ch. 3.1, 3.2, 3.3, Ch. 5.1, 5.3</li> <li>3. Assignment 3 Due</li> </ol>
6	Sep. 26	<ol style="list-style-type: none"> <li>1. Engineering Materials</li> <li>2. Metal Casting Processes</li> <li>3. Review for Mid-Term Exam</li> <li>5. Assignment 6</li> </ol>	<ol style="list-style-type: none"> <li>1. GM: Ch. 6.1, 6.2, 6.4, 9.2,</li> <li>2. GM: Ch. 11.1, 11.4, 11.6, 11.7</li> <li>3. Assignment 4 Due</li> </ol>
7	Oct. 3	Mid-Term Exam	<ol style="list-style-type: none"> <li>1. The 1st Design Project Due</li> </ol>
8	Oct. 10	<ol style="list-style-type: none"> <li>1. Metal Forming and Sheet Metalworking</li> <li>2. Material Removal Processes</li> <li>3. Nontraditional Machining and Thermal Cutting Processes</li> <li>4. Intro. to the 2nd Design Project</li> </ol>	<ol style="list-style-type: none"> <li>1. GM: Ch. 17.1 to 17.5</li> <li>2. GM: Ch. 20.1, 21.1 to 21.8</li> <li>3. GM: Ch. 25.1 to 25.4</li> <li>4. Assignment 5 Due</li> </ol>

<b>Week</b>	<b>Date</b>	<b>Topics (lecture contents)</b>	<b>Readings, Assignments, Deadlines</b>
9	Oct. 17	1. Property Enhancing and Surface Processing Operations 2. Surface Processing Operations 3. Assignment 7	1. GM: Ch. 26.1 to 26.5 2. GM: Ch. 27.2 to 27.8
10	Oct. 24	1. Fundamental of Welding 2. Welding Processes	1. GM: Ch. 28.1 to 28.4 2. GM: Ch. 29.5
11	Oct. 31	1. Friction Stir Welding and Processing 2. Prototyping and Additive Manufacturing	1. Outside Materials provided in class 2. GM: Ch. 32.1 to 32.4 3. Assignment 6 Due
12	Nov. 7	1. Processing of Integrated Circuits 2. Microfabrication Technologies 3. Assignment 8	1. GM: Ch. 33.1 to 32.6 2. GM: Ch. 35.1 to 35.2
13	Nov. 14	1. Nanofabrication Technologies 2. Automation Technologies for Manufacturing Systems	1. GM: Ch. 36.1 to 36.3 2. GM: Ch. 37.1 to 37.4 3. Assignment 7 Due
14	Nov. 21	1. Integrated Manufacturing Systems 2. Process Planning and Production Control 3. Quality Control and Inspection	1. GM: Ch. 38.1 to 38.7 2. GM: Ch. 39.1 to 39.5 3. GM: Ch. 40.1 to 40.4 4. Assignment 8 Due
15	Nov. 28	Thanksgiving Holiday (Campus Closed)	
16	Dec. 5	1. Review for Final Exam	1. The 2nd Design Project Due
Final Exam	Dec. 13	1. Final Exam	Room: E 103, from 07:15am-09:30am

# Tech 140-11 / Sustainable Product Design, Fall 2019, Course Schedule

(Schedule is subject to change with notice)

## Course Schedule

Week	Date	Topics (lab contents)	Readings, Assignments, Deadlines
1	Aug. 22 (Thursday)	(No Lab This Week)	All readings are from the required texts: 1. Planchard, D. C. (2018). Engineering design with SolidWorks 2018 etc., i.e. PD 2. Groover, M. (2019). Fundamentals of modern manufacturing etc., i.e. GM 3. Ashby, M. F. (2017). Materials selection in mechanical design (5th Ed.), i.e. AM 4. Outside Materials provided in class Readings: 1. PD: Project 1 (Page 1-36)
2	Aug. 29	1. Orientation to the lab section 2. Discuss on lab activities, policies and participation in lab & group 3. Lab team formation 4. Tutorial for Assignment 1	1. PD: Project 2 (Page 1-90) 2. PD: Project 3 (Page 1-80)
3	Sep. 5	1. Tutorial for Assignment 2 2. Tutorial for Design Project 1	1. PD: Project 4 (Page 1-78) 2. PD: Project 5 (Page 1-84) 3. Assignment 1 Due
4	Sep. 12	1. Tutorial for Assignment 3 2. Tutorial for Design Project 1	1. PD: Project 10 (Page 1-31) 2. AM: Ch. 6.1, 6.2, 6.3 3. Outside Materials provided in class 4. Assignment 2 Due
5	Sep. 19	1. Tutorial for Assignment 4 2. Tutorial for Design Project 1 3. 3-D Prototyping Design Project 1	1. AM: Ch. 6.4, 6.5 2. GM: Ch. 2.5, Ch. 3.1, 3.2, 3.3, Ch. 5.1, 5.3 3. Assignment 3 Due
6	Sep. 26	1. Tutorial for Assignment 5 2. Tutorial for Design Project 1 3. 3-D Prototyping Design Project 1	1. GM: Ch. 6.1, 6.2, 6.4, 9.2, 2. GM: Ch. 11.1, 11.4, 11.6, 11.7 3. Assignment 4 Due
7	Oct. 3	1. 3-D Prototyping Design Project 1	1. The 1st Design Project Due
8	Oct. 10	1. Tutorial for Assignment 6	1. GM: Ch. 17.1 to 17.5 2. GM: Ch. 20.1, 21.1 to 21.8 3. GM: Ch. 25.1 to 25.4 4. Assignment 5 Due
9	Oct. 17	1. Tutorial for Design Project 2	1. GM: Ch. 26.1 to 26.5 2. GM: Ch. 27.2 to 27.8
10	Oct. 24	1. Tutorial for Assignment 7 2. Tutorial for Design Project 2 3. Machine Shop Orientation	1. GM: Ch. 28.1 to 28.4 2. GM: Ch. 29.5

<b>Week</b>	<b>Date</b>	<b>Topics (lab contents)</b>	<b>Readings, Assignments, Deadlines</b>
11	Oct. 31	1. Tutorial for Design Project 2 2. Machine Shop Operation for Design Project 2	1. Outside Materials provided in class 2. GM: Ch. 32.1 to 32.4 3. Assignment 6 Due
12	Nov. 7	1. Tutorial for Design Project 2 2. Machine Shop Operation for Design Project 2	1. GM: Ch. 33.1 to 32.6 2. GM: Ch. 35.1 to 35.2
13	Nov. 14	1. Tutorial for Assignment 8 2. Tutorial for Design Project 2 3. Machine Shop Operation for Design Project 2	1. GM: Ch. 36.1 to 36.3 2. GM: Ch. 37.1 to 37.4 3. Assignment 7 Due
14	Nov. 21	1. Tutorial for Design Project 2 2. Machine Shop Operation for Design Project 2	1. GM: Ch. 38.1 to 38.7 2. GM: Ch. 39.1 to 39.5 3. GM: Ch. 40.1 to 40.4 4. Assignment 8 Due
15	Nov. 28	Thanksgiving Holiday (Campus Closed)	
16	Dec. 5	1. Lab Clean-up	1. The 2nd Design Project Due

# Tech 140-12 / Sustainable Product Design, Fall 2019, Course Schedule

(Schedule is subject to change with notice)

## Course Schedule

Week	Date	Topics (lab contents)	Readings, Assignments, Deadlines
1	Aug. 21 (Wednesday)	(No Lab This Week)	All readings are from the required texts: 1. Planchard, D. C. (2018). Engineering design with SolidWorks 2018 etc., i.e. PD 2. Groover, M. (2019). Fundamentals of modern manufacturing etc., i.e. GM 3. Ashby, M. F. (2017). Materials selection in mechanical design (5th Ed.), i.e. AM 4. Outside Materials provided in class Readings: 1. PD: Project 1 (Page 1-36)
2	Aug. 28	1. Orientation to the lab section 2. Discuss on lab activities, policies and participation in lab & group 3. Lab team formation 4. Tutorial for Assignment 1	1. PD: Project 2 (Page 1-90) 2. PD: Project 3 (Page 1-80)
3	Sep. 4	1. Tutorial for Assignment 2 2. Tutorial for Design Project 1	1. PD: Project 4 (Page 1-78) 2. PD: Project 5 (Page 1-84) 3. Assignment 1 Due on Sep. 5
4	Sep. 11	1. Tutorial for Assignment 3 2. Tutorial for Design Project 1	1. PD: Project 10 (Page 1-31) 2. AM: Ch. 6.1, 6.2, 6.3 3. Outside Materials provided in class 4. Assignment 2 Due on Sep. 12
5	Sep. 18	1. Tutorial for Assignment 4 2. Tutorial for Design Project 1 3. 3-D Prototyping Design Project 1	1. AM: Ch. 6.4, 6.5 2. GM: Ch. 2.5, Ch. 3.1, 3.2, 3.3, Ch. 5.1, 5.3 3. Assignment 3 Due on Sep. 19
6	Sep. 25	1. Tutorial for Assignment 5 2. Tutorial for Design Project 1 3. 3-D Prototyping Design Project 1	1. GM: Ch. 6.1, 6.2, 6.4, 9.2, 2. GM: Ch. 11.1, 11.4, 11.6, 11.7 3. Assignment 4 Due on Sep. 26
7	Oct. 2	1. 3-D Prototyping Design Project 1	1. The 1st Design Project Due on Oct. 3
8	Oct. 9	1. Tutorial for Assignment 6	1. GM: Ch. 17.1 to 17.5 2. GM: Ch. 20.1, 21.1 to 21.8 3. GM: Ch. 25.1 to 25.4 4. Assignment 5 Due on Oct. 10
9	Oct. 16	1. Tutorial for Design Project 2	1. GM: Ch. 26.1 to 26.5 2. GM: Ch. 27.2 to 27.8
10	Oct. 23	1. Tutorial for Assignment 7 2. Tutorial for Design Project 2 3. Machine Shop Orientation	1. GM: Ch. 28.1 to 28.4 2. GM: Ch. 29.5

<b>Week</b>	<b>Date</b>	<b>Topics (lab contents)</b>	<b>Readings, Assignments, Deadlines</b>
11	Oct. 30	1. Tutorial for Design Project 2 2. Machine Shop Operation for Design Project 2	1. Outside Materials provided in class 2. GM: Ch. 32.1 to 32.4 3. Assignment 6 Due on Oct. 31
12	Nov. 6	1. Tutorial for Design Project 2 2. Machine Shop Operation for Design Project 2	1. GM: Ch. 33.1 to 32.6 2. GM: Ch. 35.1 to 35.2
13	Nov. 13	1. Tutorial for Assignment 8 2. Tutorial for Design Project 2 3. Machine Shop Operation for Design Project 2	1. GM: Ch. 36.1 to 36.3 2. GM: Ch. 37.1 to 37.4 3. Assignment 7 Due on Nov. 14
14	Nov. 20	1. Tutorial for Design Project 2 2. Machine Shop Operation for Design Project 2	1. GM: Ch. 38.1 to 38.7 2. GM: Ch. 39.1 to 39.5 3. GM: Ch. 40.1 to 40.4 4. Assignment 8 Due on Nov. 21
15	Nov. 27	Non-Instructional Day (Campus Closed)	
16	Dec. 4	1. Lab Clean-up	1. The 2nd Design Project Due on Dec. 5