

MECH 2520 Design and Manufacturing 1
Syllabus (Spring 2024)
Session L1

Grading policy:

Web-based Self-Learning Assignments (Mostly Manufacturing)	(15%)
SolidWorks Practice Assignments (8 assignments)	(20%)
SolidWorks Design Project	(25%)
Midterm (Mostly on Design)	(15%)
Final Examination (Design and Manufacturing)	(25%)
SolidWorks Drawing Test during lab session (Compulsory)	Must Pass

Laboratory session:

- **Laboratory sessions will be started on Feb 5 (Monday)**
- SolidWorks drawing techniques and practice
- **No attendance checking but required** to submit lab assignments
- Module design discussion
- **Pass the SolidWorks Drawing test during the end of the semester (Compulsory)**

Textbook

- Shigley's Mechanical Engineering Design, Budynas, Nisbett, 2011, McGraw-Hill.
- Fundamentals of Modern Manufacturing: Materials, Processes and Systems, Groover, 2010, John Wiley & Sons, Inc.

Reference books

- Materials Selection in Mechanical Design (4th Edition), Ashby, 2011, Elsevier.
- Machinery's Handbook, Oberg et al., 2012, Industrial Press
- Dimensioning and Tolerancing Handbook, Drake, 1999, McGraw-Hill.

Lecture Content:

Engineering Design – Creative process; Design specification; Design evaluation; Product Lifecycle Management; Design Portfolio

Engineering Drawings - Communication tool; Drawing standards; Orthographic projection; 3D drawing Dimensioning and Tolerancing – Basic concepts; Dimensional tolerances - Limits and fits, Cumulative tolerances; Geometric tolerances and measurement

Material Selection -Types of materials; Design for X (Strength, Deformation, etc.);

Material Specification and Evaluation

Design Evaluation: Quality function deployment

Design for Assembly

Design for Manufacturing

Design for Manufacturing:

Primary manufacturing processes - Mold and die related processes (casting, molding, forming, sheet metal forming, powder metallurgy, composite manufacturing)

Secondary manufacturing processes: Machining processes: (turning, drilling, shaping, milling, grinding and abrasive processes, non-traditional and thermal cutting processes)

Tertiary manufacturing processes – surface finishing processes (cleaning and surface treatments, coating and deposition processes)

Jigs and Fixture Design

Jigs and Fixtures components

Jigs and Fixtures design principles

Course Schedule:

Week	Lecture & Tutorial	Self-Learning	Lab Session (LA1-LA4)	SOLIDWORKS Assignments
1	In-class orientation: Course Introduction & Structure (Lectures, Assessments, Labs, Software tools, etc.)	-		
2	Engineering Design – Creative process; Design Portfolio, Design evaluation; Design specification	Functional and Engineering Specification	Computer set up for using SolidWorks in virtual barn	No
3	Mechanical Element – Introduction of key mechanical element in engineering design	Key mechanical design element learning	Introduction of SolidWorks	No
4	Engineering Drawings, Dimensional Tolerance: Communication tool; Dimension tolerance, Limits & Fits, Cumulative tolerance	Dimensioning & Tolerancing	Create a custom plane and find the center of mass	#1Tilting plate
5	Material Selection: Types of Materials, properties, engineering usage, Material Specification, and Evaluation	Material Selection	SolidWorks practice (I) 3D modeling of Tire and Rim (I)	#2Model of Tire and Rim
6	Design Evaluation: Quality function deployment, Design for Assembly Online quiz mock-up (if necessary)	Material Evaluation	SolidWorks practice (II) 3D modeling of Tire and Rim (II)	#3Mass and cg of wheel
7	<u>Midterm</u>		SolidWorks Modeling Exercise (I)	#4Model of given drawing
8	Design for Manufacturing - Primary manufacturing processes: casting, molding, forming, sheet metal forming, powder metallurgy, composite manufacturing	Design for Primary Manufacturing	SolidWorks Modeling Exercise (II)	#5Model of given drawings
	Mid Term Break			
9	Design for Manufacturing - Secondary manufacturing processes: machining processes: turning, drilling, shaping, milling.	Design for Secondary Manufacturing	SolidWorks Modeling Exercise (III)	#6Model of given drawings
10	Design for Manufacturing - Tertiary manufacturing processes – surface finishing processes: cleaning and surface treatments, coating, and deposition processes.	Design for Tertiary Manufacturing	SolidWorks Modeling Exercise (IV)	#7Model of given drawings
11	Design for Manufacturing - Tertiary manufacturing processes – surface finishing processes: cleaning and surface treatments, coating, and deposition processes.	Manufacturing process selection	Self-practice for the drawing test	#8Model of given drawings
12	Additive Manufacturing	Review (Design)	SolidWorks Drawing Mock Test	Compulsory to pass
13	<u>Design Expo</u>	Review (Manufacturing)	SolidWorks Drawing Test	Lab for final design expo preparation
	<u>Final Exam (17-29/May)</u>			