



University of Michigan

— 交大密西根学院 —

UM-SJTU Joint Institute



Shanghai Jiao Tong University

# Course Profile

## Degree Program:

- ECE-Electrical & Computer Engineering
- ME -Mechanical Engineering
- General Courses for Both ECE & ME Degree Programs

Course Name: **Design and Manufacturing I**

Course Code: Vm250

Course Credits: 4

Course Category:  Required  Elective

## Terms Offered:

- Fall \_\_\_\_\_ (YYYY-YYYY)
- Spring \_\_\_\_\_ (YYYY-YYYY)
- Summer \_\_\_\_\_ 2017 \_\_\_\_\_ (2016-2017)

## Course Pre/Co-requisites:

VV156 or VV186, VG100, VM010 or VM020

## Textbook:

Kalpakjian and Schmidt, Manufacturing Engineering and Technology, Forth (or Fifth) Edition, Prentice-Hall, 2001, ISBN: 0-201-36131-0

Other supplementary course materials will be available during the lecture and posted at course Canvas site.

## Instructors:

Prof. Mian Li

Email: [mianli@sjtu.edu.cn](mailto:mianli@sjtu.edu.cn)

Tel: 3420-7212

Office: JI Bldg. 207

Office Hour: Friday 14:00 – 16:00.

## Teaching Assistants:

	Mr. WANG Chunpeng	Ms. WANG Zhiyu	Mr. ZHU Shenyun
Email	<a href="mailto:cliffwang@sjtu.edu.cn">cliffwang@sjtu.edu.cn</a>	<a href="mailto:DaisyWangZhiyu@sjtu.edu.cn">DaisyWangZhiyu@sjtu.edu.cn</a>	<a href="mailto:kimi_nickel_zsy@sjtu.edu.cn">kimi_nickel_zsy@sjtu.edu.cn</a>
Office hour	Thu 20:00-22:00 (R228, JI Building)		



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**Grading Policy:**

Exam I	20%
Exam II	20%
Lecture homework (best 10 of all assigned)	10%
Lab homework	10%
Project prototype	20%
Written project report	15%
Oral project presentation	5%

There will be no attendance policy enforced in this class. However, 5 points will be given as bonus at the end of the semester if you keep a good record of attendance for lectures as well as lab work.

**Policy for Late Submission**

Every homework should be submitted to the instructor or TAs by the beginning of the class on the due day. Fail to submit the homework on time will get 25% deduction per day.

If you miss Exam I due to an “excused absence”, the percentage missed will be added to the Exam II with 15% deduction. (Note: an excused absence is one that follows the University guidelines and is approved by the instructor.) While absences from the class are discouraged, sometimes circumstances arise that require missing a class. In the event that you do miss a class, it is the student’s responsibility to contact someone in the class or the instructor to determine the material that was covered. Please note that the instructor can assist you in identifying the material that you have missed but that a detailed synopsis of the missed lecture will not be given.

Review of the grading: If you feel that there is a problem for you grading, you could re-submit your homework (or exam) to the TA or instructor for a review. However, the review will be conducted by both the instructor and TA and will take some time.

Lots of course materials, assignments, and examples will be distributed through Canvas system. Important notices will also be distributed through the email system in Canvas. ***It is students’ responsibility to check the posted information in Canvas and check the course-related emails from their registered email addresses.***

**Academic Integrity:**

Lecture and lab homework are to be completed on your own unless specified as group assignments. This means:

- You are not allowed to sit together and work out the details of the problems with anyone.
- You are not allowed to discuss the problem set with previous class members, nor anyone else who has significant knowledge of the details of the problems set.
- Nor should you compare your written solutions, whether in scrap paper form or your final work product, with other students (and vice versa).
- You are also not allowed to possess, look at, use, or in any way derive advantage from the existence of solutions prepared in previous years.

**Violation of this policy is considered as violation of the honor code and is grounds for the Instructor(s) to initiate an action that may lead to grade reduction, course withdrawal, university suspension or expulsion.**



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For your information, the UM-STJU JI has a nationally recognized Honor Code of Academic Integrity. This Code sets standards for academic integrity for all students. As a student you are responsible for upholding these standards. For more information on the Honor Code at UM-SJTU Joint Institute, please visit <http://umji.sjtu.edu.cn/academics/academic-integrity/honor-code/>. To further exhibit your commitment to academic integrity, after each examination, students must sign their names on the Honor Pledge in the test paper. The Honor Pledge is as follows: "I have neither given nor received unauthorized aid on this examination, nor have I concealed any violations of the Honor Code." Instructors are not required to grade tests in which the signed Honor Pledge does not appear. The Honor Code remains enforced whether or not the student signs the Pledge.

**Lecture section: (classroom: Dong Zhong Yuan E4-504)**

Tuesday 16:00 - 17:40  
 Thursday 16:00 - 17:40  
 Friday 10:00 - 11:40 (even weeks only, starting from the second week)

**Lab section:**

**Notice: Anyone who are taking Vm250 should pass Vm020 in the previous Spring semester. For those who do not or cannot due to special reasons, please see the instructor at the starting of the semester.**

The schedule of lab sections will be posted on Canvas. There are two Lab parts.

- First part:
  - CAD training using Unigraphics NX.
  - Place: JI computer room (in YLM Student Center)
  - Duration: 2nd-5th JI week.
  - Time:
    - Session 1: Tue 18:20 - 21:50
    - Session 2: Fri 12:10 - 15:40
- Second part:
  - Catapult Design and Manufacturing.
  - Place: Design and Manu. Lab (2<sup>nd</sup> floor of Student Innovation Center)
  - Duration: 6th-12th JI week.
  - Time:
    - Session 1: Mon 16:00 - 17:40, 18:20 - 20:00
    - Session 2: Fri 16:00 - 17:40, 18:20 - 20:00

Within every week, you are required to sign up one session and attend it. Attendance sheet will be used in Lab sessions.

**Vm010:**

**Notice: All international (exchange and degree) students need to take Vm010 together with Vm250 during the semester.**

The schedule of Vm010 will be posted on Canvas.

- Content: Machine shop training.
- Place: Machine shop in the Student Innovation Center



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- Duration: 2nd-5th JI week.
- Time: Wed 14:30 - 18:00

**Within every week, you are required to sign up one session and attend it. Attendance sheet will be used in Lab sessions.**

### **Course objective:**

1. Introduce students to the complexity of engineering practice and to follow the development of an idea from its conception to the construction of a prototype
2. Develop the technical skills necessary to generate an engineering drawing with appropriate dimensions, tolerances, and specifications, and an engineering assembly, using free-hand sketching and a modern CAD system
3. Develop a 'hands on' experience through machine shop training, lab sessions, and the construction of a physical artifact
4. Introduce basic mechanical elements and basic materials and learn the practice and limitations of basic prototyping and manufacturing tools.
5. Introduce the elements of engineering communications and develop team collaboration and leadership skills, including graphical representation of artifacts, teamwork, written reports, and oral presentations
6. Introduce uncertainty as an element of engineering practice, including material properties, process performance, and market demands
7. Obtain a basic understanding of various engineering materials and the manufacturing techniques used to produce these materials into useful products
8. Develop systems thinking and integrate a diversity of skills in a challenging and fun open-ended design project.
9. Learn to assess and manage project risks, milestones and schedules,

### **Outline:**

1. Visualization, geometry modeling, and engineering drawing
2. Computer Aided Design (CAD), Computer Aided Manufacturing (CAM)
3. Geometric dimensioning and tolerances
4. Customer requirement, QFD, concept selection, concept design
5. Review of elementary statistics
6. Mechanical elements (e.g., gears, bearings, springs, motors)
7. Manufacturing processes
8. Machine shop techniques, including safety
9. Writing technical reports and making technical presentations
10. Introduction to team-working

### **Homework:**

There will be 11 homework from the lecture and 4 from the lab work. The best 10 of lecture homework and all 4 lab homework will be accounted for the grading.



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### **Project:**

Course-work will also consist of one semester-long group project. Your group members will be chosen *by the instructor* based on some criteria. There are two design reviews before the final presentation. Final project presentations and a competition are to be on **Aug 4**. A detailed final report for the project will be due on **Aug 8 (Tue)**.

### **Exams:**

There will be two exams in this course, each of which accounts for 20 points in the final grade. The content covered in each exam will be specified during the lecture. Exam I is scheduled on **July 4** and Exam II takes on **Aug 8 (Tue)**.

### **Peer evaluation:**

Since team activity is an essential part of this course, you will be asked to submit a peer evaluation sheet at the end of the semester, in order to evaluate participation of each team member (including yourself) to project activities. Peer evaluation form is available on the course Canvas site under “Final Project.”



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**Lecture Time Table: (tentative)**

Week #	Date	Topic	Hw out	Hw due
1	May 16	Course Introduction, Orthographic views		
	May 18	Orthographic views, Pictorials	HW1	
2	May 23	Sectional views; Auxiliary views		
	May 25	Conceptual design, QFD; Gantt Charts, Semester project	HW 2	
	May 26	Dimensioning		HW 1
3	May 30	Holiday of Dragon Boat Festival		
	Jun 1	Dimensioning	HW 3	HW 2
4	Jun 6	Tolerances	HW 4	
	Jun 8	Tolerances		
	Jun 9	Analysis and Statics		HW 3
5	Jun 13	Transmission (Gear, pulleys, belts, chains, etc.)	HW 5	HW 4
	Jun 14	Bearings and wheels		
6	Jun 20	Motor, control and system		HW 5
	Jun 22	Statistics and probability	HW 6	
	Jun 23	Machine elements (Springs, power screws)		
7	Jun 27	Design review		
	Jun 29	Design review		HW 6
8	Jul 4	<b>Exam I</b>		
	Jul 6	Materials selection and testing	HW7	
	Jul 7	Overview of manufacturing processes		
9	Jul 11	Material removal processes	HW 8	
	Jul 13	Material removal processes; Machining process planning		HW 7
10	Jul 18	Casting	HW 9	
	Jul 20	Stamping, Forging, Extrusion,		HW 8
	Jul 21	Analysis: Dynamics	HW 10	
11	Jul 25	Polymer shaping processes		HW 9
	Jul 27	Finishing, joining, and assembly	HW 11	
12	Aug 1	Presentation of the project,		HW 10
	Aug 3	Presentation of the project,		
	Aug 4	Vm250 Expo		HW 11
13	Aug 8	<b>Exam II</b>		<b>Project Report due!</b>



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**Lab Time Table: (tentative) (Tue/Mon and Fri)**

Week	Topic	Location	Lab out	Hw	Lab Hw due	TAs
2 <sup>nd</sup>	Lab overview and Introduction to CAD software 2D sketching	Jl computer room (in YLM Center)	HW 1			WCP/WZY(Tue), ZSY/WZY(Fri)
3 <sup>rd</sup>	2D sketching , 3D Modeling	“”	HW 2	HW 1		WCP/WZY(Tue), ZSY/WZY(Fri)
4 <sup>th</sup>	3D Modeling; Engineering drawing	“”	HW 3	HW 2		WCP/ZSY(Tue), ZSY/WZY(Fri)
5 <sup>th</sup>	UG practice	“”	HW 4	HW 3		WCP/ZSY(Tue), ZSY/WZY(Fri)
6 <sup>th</sup>	Open shop for project, project equipment and sets	Design & Manuf. Lab (2 <sup>nd</sup> floor)			HW 4	WCP(Mon) WZY(Fri)
7 <sup>th</sup>	Design Review 1	“”				WCP(Mon) WZY(Fri)
8 <sup>th</sup>	Open shop for project	“”				WCP(Mon) WZY(Fri)
9 <sup>th</sup>	Open shop for project	“”				WCP(Mon) ZSY(Fri)
10 <sup>th</sup>	Design Review 2	“”				WCP(Mon) ZSY(Fri)
11 <sup>th</sup>	Open shop for project	“”				WCP(Mon) ZSY(Fri)
12 <sup>th</sup>	Open shop for project	“”				WCP(Mon) ZSY(Fri)
13 <sup>th</sup>	<b>Project presentation and competition</b>	Student Innovation Center				Mian Li/All