

**Semester** Spring 2023  
**Course Title** ME1029 Mechanical Design 2

**Instructor** Professor Ping C. Sui, Ph.D.  
Office: Zone 4-222  
e-mail: [ping.sui@scupi.cn](mailto:ping.sui@scupi.cn)

**Office Hours** Wednesday 1:00-5:00PM  
Thursday 1:00-5:00PM

**Teaching Assistant** Xuyi Zhang  
E-mail: [2019141520052@stu.scu.edu.cn](mailto:2019141520052@stu.scu.edu.cn)

**Lecture Time** Wednesday 8:15-11:00AM  
**Lecture Room** Zone 3-103

**Prerequisites** MEMS 1028 Mechanical Design 1  
MEMS 0024 Intro to ME Design

**Textbook** Shigley's Mechanical Engineering Design by Richard G. Budynas and J. Keith Nisbett, 10th edition, McGraw-Hill Education, 2015.

**Course Description** This course is a 3-credit hour class. It is an advanced study with focus to introduce elements frequently used in mechanical designs. As the class evolves, students will develop (1) functionality understanding of components in static and dynamic mechanical applications, (2) thought process in the decision of selecting components for the targeted applications, and (3) analysis and synthesis methodologies for evaluation of the structural risks of the selected components.

To facilitate the understanding, design practices will be given to students periodically. Students will apply the learned knowledge to size their designs, deliberate the pros and cons of their designs, and systematically draw conclusions per analytical opinions.

Students will also involve in an extensive design project in this class. Students in teams will compete to develop a design for a product, applying structured design practices to real hardware.

### Course Outline

Session	Class Date	Chapter	Topics	Homework
1	Feb 22		LN00 Course Overview	
2	Mar 01	Ch.3.16, 7.8 5.3 – 5.5, 5.7	LN01 Interference Fit Design LN02 Failures Resulting from Static Loading	HW01
3	Mar 08	Ch.06	LN03 Review: High-Cycle Fatigue Design	HW02
4	Mar 15	Ch.06 Ch.07	LN03 Review: High-Cycle Fatigue Design LN04 Shafts and Shaft Components	HW03 <a href="#">Design Exercise 01</a>
5	Mar 22	Ch.07	LN04 Shafts and Shaft Components	HW04
6	<a href="#">Mar 29</a>		<a href="#">Section Exam 01</a>	
7	<b>Apr 05</b> (清明节)	Ch.11	LN05A Rolling Contact Bearings: Ball Bearings	HW05
8	Apr 12	Ch.11	LN05A Rolling Contact Bearings: Ball Bearings LN05B Rolling Contact Bearings: Tapered Roller Bearings; Direct/Indirect Mount	HW06 <a href="#">Design Exercise 02</a>
9	Apr 19	Ch.12	LN06A Lubrication & Journal Bearings	HW07
10	Apr 26	Ch.12	LN06B Lubrication & Journal Bearings	HW08
11	May 03		<a href="#">Section Exam 02</a>	
12	May 10	Ch.08	LN07A Nonpermanent Joints	HW09
13	May 17	Ch.08	LN07B Nonpermanent Joints	HW10
14	May 24	Ch.08 Ch.11	LN07C Nonpermanent Joints LN08A Gear Fundamentals	HW11

15	May 31		<b>Section Exam 03</b>	
16	Jun 7	Ch.11	LN08A Gear Fundamentals	HW12 <b>Design Exercise 03</b>
17	Jun 14		LN08B Spur Gear Design Analysis	
18	Jun 21			DE03 Report Due

In-Class Exercises	Hands-on calculation questions given in class to familiarize students with the lectured contents																																																
Homework	<p>Problem sets will be distributed each week after the class. Each problem set is designed to build upon the material covered in the preceding lectures and recitations.</p> <p>Homework assigned in a particular class is due at 8 AM on the day of the next class period, unless otherwise posted.</p> <p><u>Late HW will not be accepted.</u> HW missed due to unforeseeable emergencies will be handled on a case-by-case basis.</p>																																																
Design Exercises	<p>Purposes</p> <ul style="list-style-type: none"> <li>• apply the learned knowledge to practice sizing their designs,</li> <li>• deliberate the pros and cons of their designs,</li> <li>• Identify the failure mechanisms and define pass/fail criteria, and</li> <li>• Draw systematical conclusions per analytical opinions.</li> </ul> <p>Duration: ~2-3 Weeks for each DE Detailed requirements for DE report will be furnished later.</p>																																																
Section Exams	<p>Three section exams.</p> <p>Section exams will be fast-paced and computation-intensive. Purpose is to test student's proficiency and familiarity with the section contents.</p> <p>The exams in this course will be open-book and open-note.</p> <p><u>No make-up will be given for the missing exam.</u> Exams missed due to unpredictable events will be dealt with on a case-by-case basis.</p> <p>Bring one engineering calculator to the exams. You will need it.</p> <p>No programmable calculator of any kind is permitted in ME exams.</p>																																																
Grades	<p>In-Class Exercises: 10%</p> <p>Homework: 15%</p> <p>Section Exams: 45%</p> <p>Design Exercises: 30%</p> <p>附件：等级成绩和百分成绩、绩点对照表</p> <table border="1" data-bbox="446 1270 1295 1537"> <tr> <td>字母等级</td> <td>A</td> <td>A-</td> <td>B+</td> <td>B</td> <td>B-</td> <td>C+</td> <td>C</td> <td>C-</td> <td>D+</td> <td>D</td> <td>F</td> </tr> <tr> <td>中文等级</td> <td colspan="2">优秀</td> <td colspan="2">良好</td> <td colspan="2">中等</td> <td colspan="3">合格</td> <td colspan="2">不合格</td> </tr> <tr> <td>百分制</td> <td>100-90</td> <td>89-85</td> <td>84-80</td> <td>79-76</td> <td>75-73</td> <td>72-70</td> <td>69-66</td> <td>65-63</td> <td>62-61</td> <td>60</td> <td>&lt;60</td> </tr> <tr> <td>绩点</td> <td>4</td> <td>3.7</td> <td>3.3</td> <td>3</td> <td>2.7</td> <td>2.3</td> <td>2</td> <td>1.7</td> <td>1.3</td> <td>1</td> <td>0</td> </tr> </table>	字母等级	A	A-	B+	B	B-	C+	C	C-	D+	D	F	中文等级	优秀		良好		中等		合格			不合格		百分制	100-90	89-85	84-80	79-76	75-73	72-70	69-66	65-63	62-61	60	<60	绩点	4	3.7	3.3	3	2.7	2.3	2	1.7	1.3	1	0
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Class Attendance	<p>Students are expected to attend every class period.</p> <p>Early is on time, on time is late. As a courtesy to your fellow classmates, be punctual and arrive no later than the class starting time.</p>																																																
Academic Honesty	<p>All of us are equally responsible for ensuring a fair and positive learning environment. Students involved in or with academic dishonesty will be dealt with in the most strict manner regardless the extent of involvement.</p> <p>Students are permitted to discuss homework assignments together but should do their own work when preparing a problem solution.</p> <p>Any student caught cheating on an assignment or exam will receive disciplinary action, up to and including receiving a grade of "F" for the course.</p>																																																