MEMS 0040: Manufacturing Processes and Analysis

2025 Spring

Instructor:	Shan Gong	**Section 1:**	Mondays 8:15 am – 11:00 am
Email:	shan.gong@scupi.cn	**Section 1:**	Tuesdays 8:15 am – 11:00 am
		Location:	SCUPI New Building S201
Office:	N406		

Note: This syllabus may be subject to change. Please follow updates announced during class and posted on Blackboard website.

Course Pages:

- https://pibb.scu.edu.cn

Office Hours:

- Mondays: 13:00pm–17:00pm & Mondays: 13:00pm–17:00pm
- By appointment via Email: shan.gong@scupi.cn
- Online via QQ Group: 544010569

Teaching Assistant:

- Section 1: Aria Zhang, 2022141520021@stu.scu.edu.cn
- Section 2: Chaowei Deng, 2021141520062@stu.scu.edu.cn
- If you have any question regarding to homework grading, please contact TA within one week after the homework is returned to you.

When emailing the instructor or TAs, include MEMS 0040 in the subject field of your message. Use your university email account (student_ID_number@stu.scu.edu.cn), since mails from other accounts might be stopped by the SCU spam filter.

Course Description

This is an undergraduate course in manufacturing processes and analysis. Topics include: manufacturing properties, casting, metal forming (rolling, forging, extrusion, and drawing), polymer processing, particulate processing (powder metallurgy and ceramic/glass forming), heat treatment, welding, and machining. Prerequisite: Materials Structure & Properties, Chemistry. 3 Credit hours.

Prerequisites:

- ENGR 0022: Materials Structure and Properties

Course Objectives

A deep understanding of physical mechanisms and capabilities of manufacturing processes plays a key role in industrial production. To ensure such a good understanding, students should be able to perform tasks showing below upon completing this course:

1. To understand the fundamental principles of materials processes and manufacturing
2. To gain knowledge of various manufacturing processes and related technical analysis
3. To understand the importance of economic considerations in the selection of manufacturing processes

Applicable ABET Outcomes

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
3. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Textbook

- Mikell P. Groover, Fundamentals of Modern Manufacturing: Materials, Processes, and Systems. 7th edition.

Assessments

Attendance and Answer Questions in Class	10%
Homework:	30%
Midterm Examination:	30%
Final Examination:	30%
	100%

- The Instructor reserves the right to moderate the assessment policy. This process may occur at the end of the semester.

Grade

90.00 – 100.00	A	85.00 – 89.99	A-	80.00 – 84.99	B+	76.00 – 79.99	B	73.00 – 75.99	B-
70.00 – 72.99	C+	66.00 – 69.99	C	63.00 – 65.99	C-	60.00 – 62.99	D	0.00 – 59.99	F

Class Policy

Regular attendance is essential and expected. Important dates and plans will be announced during class. **It is imperative that you come to class prepared.** This will generally involve reading one or more chapters of the textbook, viewing tutorial videos, thinking, engaging with fellow students, practice and performing preliminary calculations. This is a three credit hour class, which means you should expect to devote at least 9 to 12 hours of effort outside the scheduled class time every week.

Homework and Other Assignments

Homework problems and other assignments will be assigned periodically and are due as stated in the assigned paper. All work will be submitted electronically through the Blackboard system. Late submission **WILL NOT** be accepted. **Students' names and ID numbers** must be listed on the first page. It is **your duty** to make sure that submission through Blackboard has been properly processed. Unless specifically requested, emailed homework will not be accepted.

All of the homework scores will be used in your grade computation. Unless otherwise indicated, you can work with your fellow classmates in the class, but you must submit a distinct and independent write-up to receive credit. If plagiarism is caught, zero score for all homeworks.

If you have a compelling emergency that prevents you from turning in the homework on time, email Dr. Shan Gong.

If you believe an error has been made in the grading of an assignment, bring it to the attention of your TA **within ONE WEEK** from its return.

Please adhere to these **homework guidelines:**

- Put your name, ID number (last four digits), and class section at the top of the first page.
- All work must be shown for each solution to receive full credit. Present your solution in a logical fashion, showing and explaining all steps in detail.
- Obtaining the correct answer includes getting the correct quantity, **number of significant digits**, sign, and **unit**.

Exams

There will be two exams (one Midterm and one Final), all are **CLOSED-BOOK**. Students can bring **one** A4 page note and it must be **hand-written** on **two sides** of the paper. It cannot be a photocopy. If you must miss an exam, you **MUST** make alternative arrangements with the instructor before the exam is given. If you miss an exam without prior notification, you will receive a score of **ZERO** for that exam except under extenuating circumstances.

Make-Up Exams

Students who have not taken either the midterm or the final exam are **NOT** eligible to take the make-up exam. Only 75% of the make-up exam grade can be used to **replace** the final exam grade. Students taking make-up exams can only attain at most a **D** grade.

Academic Integrity

1. It is a requirement that every student performs independent and collaborations under the academic guidelines set forth by SCUPI, Sichuan University, and University of Pittsburgh to ensure rightful learning performance.
2. Unacknowledged direct copying from the work of another person, or the close paraphrasing of somebody else's work, is called plagiarism and is a serious offence, equated with cheating in examinations. This applies to copying both from other students' work and from published sources such as books, reports or journal articles.
3. Paraphrasing, when the original statement is still identifiable and has also no acknowledgement, is plagiarism. A close paraphrase of another person's work must have an acknowledgement to the source. It is not acceptable for you to put together Unacknowledged passages from the same or from different sources linking these together with a few words or sentences of your own and changing a few words from the original text: this is regarded as over-dependence on other sources, which is a form of plagiarism.

Accommodations

If you sustain disability or sickness that requires testing and/or classroom accommodations, please notify the course instructor, TA, and the university's Disability Resources and Services in time. You may be asked to present proof of disability or sickness to be provided the accessibility accommodations.

Course Content

A schedule in detail will not be available as the pace of the course will highly be determined by students' reception of the content.

Week	Contents	Topics
1	Chapter 1	Introduction
2	Chapters 2-5	Materials and manufacturing properties
3	Chapter 10	Fundamentals of metal casting
4	Chapter 10	Fundamentals of metal casting
5	Chapter 11	Metal casting processes and economics
6	Chapter 17	Fundamentals of metal deformation and forming
7	Chapter 18	Metal forming: Bulk deformation Process
8	Chapter 19	Metal forming: Sheet metalworking
9	Chapter 20	Theory of metal machining
10	Chapters 21-23	Machining operations, machine tools and economics
11	Chapters 21-23	Machining operations, machine tools and economics
12	Chapter 28	Fundamentals of welding
13	Chapters 29-30	Welding process analysis and economics
14	Chapters 29-30	Welding process analysis and economics
15	Chapter 15	Powder metallurgy
16	Chapter 26	Heat treatment of metals
17		Review and Exam