

EERT 22095: Cleanroom-Based Semiconductor Fabrication
Summer -2024
David J. Kirby Ph.D.

COURSE INFORMATION

Class Meeting..... TBA
Office LocationBy appointment
Phone/E-mail..... Teams Call Only/ dkirby5@kent.edu
Office Hours.....By appointment

CATALOG DESCRIPTION

Special topics in electrical/electronic engineering technology.

Cleanroom-Based Semiconductor Manufacturing is an experiential learning, hands-on experience in a clean room environment. Technical learning will be complemented with guest speakers from the semiconductor industry and lessons in advanced manufacturing technologies.

RECOMMENDED REFERENCES

Will be provided on Canvas for individual topics

REQUIRED TEXT

None

REQUIRED SOFTWARE/ONLINE SUBSCRIPTIONS

None

COURSE LEARNING OBJECTIVES (CLOS)

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

1. Explain the fundamentals of cleanroom operation and protocols including control and monitoring of humidity and temperature, HEPA filtration, air turbulence, and contamination sources and prevention
2. Describe vacuum system maintenance and troubleshooting,
3. Describe basic deposition techniques and identify the equipment used by these techniques
4. Explain the processing steps applied in photolithography, etching (dry and wet etch), and other patterning and printing techniques
5. Apply best practices for data collection, analysis and statistics.

COURSE OUTLINE

The course outline is subject to change throughout the semester. It is the responsibility of the faculty member to notify students of changes; it is the responsibility of the student to keep track of adhering to the changes. Check your email and course announcements frequently!

Week	Lesson	Date	Topic
1	1	28-May	Setting the Stage – Intel Virtual Visit, Introduction/Overview Syllabus
	2	29-May	Safety Training
	3	30-May	Safety Training
	4	31-May	Vacuum gauges, leak detection and troubleshooting in vacuum systems
2	5	3-Jun	What is a Clean Room? - Basics, Temperature, Constants, HEPA, etc
	6	4-Jun	CR Rotations*
	7	5-Jun	CR Rotations
	8	6-Jun	CR Rotations
	9	7-Jun	CR Rotations
3	10	10-Jun	CR Rotations
	11	11-Jun	CR Rotations
	12	12-Jun	CR Rotations
	13	13-Jun	CR Rotations
	14	14-Jun	CR Rotations
4	15	17-Jun	CR Rotations
	16	18-Jun	CR Rotations
	17	19-Jun	Juneteenth - Holiday
	18	20-Jun	CR Rotations
	19	21-Jun	CR Rotations
5	20	24-Jun	CR Rotations
	21	25-Jun	CR Rotations
	22	26-Jun	CR Rotations
	23	27-Jun	CR Rotations
	24	28-Jun	Poster Session

* A CR Rotation plan will be released to the students at the start of the semester. This will outline the exact CR and Non-CR activities and the dates that each student will attend each session.

FINAL EXAM

The final exam period is Friday June 28th 2024. Instead of taking a final exam, student final assessment will be in the form of a summative project. Course final reporting is also due at the final exam period.

ASSESSMENT

Requirement	Points
Safety Training	50
Protocols	40
Summaries	20
Project Presentation	100
Attendance/Participation	25
Total	235

Safety Training: All students will participate in the scheduled cleanroom and chemical safety training courses. Passing the subsequent assessments is required before students may enter and work in the cleanroom. The scores from the institutional assessments will be scaled to 50 points for the course grade.

Summaries: At the end of the cleanroom and vacuum lessons, students will be assigned a digital summary assignment. To complete this assignment, students will write five bullet point sentences that summarize the key ideas of the day. These are due by 9:00 pm on the day of the lesson and responses will be reviewed the following day at the start of the next lesson.

There will be 3 assignments worth 5 points each, 1 point for each bullet point response. Responses are only correct if written in complete sentences and if they contain content from the daily lesson.

Protocols: During CR experiences, students will take notes and write up formal protocols for the operation of the equipment that was used during that experience. Students will also use generative artificial intelligence to create a protocol for the use of each specific method. To complete these assignments, students will write a paragraph assessing how their hands-on experience differed from the protocol generated by the AI. Each assignment will be worth 10 points and will be due at the start of the next day's class. A grading rubric will be provided.

Presentation: Students will produce a presentation as the capstone to this course. The presentation will be based on the work students do inside the cleanroom and will occur on the last day of the term. Presentations will be done as a team and all teammates must participate. Further details including a grading rubric, content, and format of the presentation will be provided in future documents.

Attendance/Participation: There are several days during the term in which outside speakers have been invited to provide career advice and professional development opportunities to the class. Additionally, student participation will be key to the hands-on experiences, data collection, and analysis. The instructor will note attendance and participation during these sessions will be recorded for a grade totaling 25 points at the terms end.

GRADE SCALE

A	≥ 90%	C	≥ 70.0 and <76.5%
B+	≥ 86.5 and < 90%	D	≥ 60.0 and <70%
B	≥ 80.0 and < 86.5%	F	< 60.0
C+	≥ 76.5 and < 80%		
