SAMPLE SYLLABUS

This syllabus is to be used as a guideline only. The information provided is a summary of topics to be covered in the class. Information contained in this document such as assignments, grading scales, due dates, office hours, required books and materials may be from a previous semester and are subject to change. Please refer to your instructor for the most recent version of the syllabus.

ABET Course Syllabus EEE439

1. **Course: EEE 439 Semiconductor Facilities and Cleanroom**
2. **Credits and Contact Hours:** 3 Credit Hours (lecture), Topics: Engineering
3. **Course Coordinator:** Dr. M.N. Kozicki, Professor
4. **Textbook:** None

   Supplemental materials:
   Ronald Tolliver (Ed.), *Handbook of Contamination Control in Microelectronics*, Noyes, 1988. W. Whyte (Ed.), *Cleanroon Design,* Wiley, 1991.
5. **Specific course information**
   a. **Catalog description:** Microcontamination, controlled environments, cleanroom layout and systems, modeling, codes and legislation, ultrapure water, production materials, personnel and operations, hazard management, advanced concepts.
   b. **Prerequisites or co-requisites:** EEE 435 or any course that includes device fabrication or instructor approval.
   c. **Required/elective/selected elective:** Elective
6. **Specific goals for the course**
   - Students will be conversant with controlled environment concepts
   - Students will understand and utilize contamination management

   a. **Outcomes of instruction:**
      1. Students will know what cleanrooms are and how they are used
      2. Students will understand the nature of contamination
      3. Students will be able to design basic/generic cleanrooms
      4. Students will become familiar with the hazard management aspects of cleanrooms

   b. **Outcomes of Criterion 3 addressed by the course:**
      (1) Students are encouraged to apply their broad knowledge of mathematics, science, and engineering (including those disciplines outside EE). Students see via examples how to identify, formulate, and solve engineering problems.
      (2) Design exercises allow students to solve open-ended design and analysis problems.
      (2,6) Computers and math software are used to model and design controlled environments.
      (3) Report writing improves student ability to communicate effectively.
      (7) Advanced manufacturing methods are highlighted.

7. **Brief list of topics to be covered**
   1. Yield and reliability in semiconductor processing
   2. Microcontamination types and sources
   3. Controlled environments
   4. Performance standards
   5. Parameter measurement
   6. Construction materials and techniques
   7. Air filtration
   8. Airflow
   9. Decontamination
   10. Cleanroon layout
   11. Equipment integration

12. Cleanroom modeling
13. Preconditioning, static, and vibration
14. Codes and legislation
15. Ultrapure water: characterization and production
16. Production materials: gases and chemicals
17. Cleanroom apparel
18. Operational practices
19. Hazards and industrial hygiene
20. Hazard management
21. Advanced concepts: microenvironments and robotics

Computer Usage:
The midterm project involves the design of a computer model relating to controlled environments. Students are allowed to use the programming language (or spreadsheet, iterative solver, etc.) of their choice. The model is tested using realistic data obtained by literature review.

Laboratory Experiments:
This is not a laboratory course, but students are typically exposed to a "real" cleanroom by touring the CSSER facility during one of the class periods near the end of the semester.

Course Contribution to Engineering Science and Design:
This course teaches engineering science and design via the application of basic scientific and engineering principles to engineering problems. For example, students use their knowledge of chemistry, physics, and electrostatics to explain aspects of particle behavior in air and on surfaces and to understand how to avoid the problems of electrostatic discharge in integrated circuits. They also use knowledge from engineering core courses, such as fluid dynamics and mass and energy conservation, to design and model controlled environments.

Person preparing this description and date of preparation: Michael Kozicki, K. Tsakalis, June, 2021.