COURSE NUMBER: ME 5116, 4 credits	**COURSE TITLE:** Clean Room Technology and Particle Monitoring
TERMS OFFERED: Spring Semester	**PREREQUISITES:** ME 5113 Aerosol/Particle Engineering, IT upper division or Grad student.
TEXTBOOKS/REQUIRED MATERIAL: "Aerosol Technology"2nd Edition, By W.C. Hinds, John Wiley & Sons, NY Reference: ACGIH "Air Sampling Instruments" 8th Ed. Selected papers on special topics	**PREPARED BY:** David Y. H. Pui **DATE OF PREPARATION:** May 2007
COURSE LEADER(S): David Y. H. Pui	**CLASS/LABORATORY SCHEDULE:** Three 100 minute lectures every two weeks, plus one 3-hr Lab Experiment every two weeks. **CONTRIBUTION OF COURSE TO MEETING PROFESSIONAL OBJECTIVES:** 100 % Engineering Topics
CATALOG DESCRIPTION: Fundamentals of cleanroom technology for microelectronics manufacturing; airborne and liquid-borne particulate contaminants; particle monitors: optical and condensation particle counters, wafer surface scanner, microscopy; filter performance and testing; cleanroom design and operation; high purity systems; particle detection in processing equipment	**COURSE TOPICS:** 1. Introduction to microcontamination control in semiconductor manufacturing. 2. Cleanroom particle monitors: laser particle counter and condensation nucleus counter. 3. Fundamentals of aerosol mechanics. 4. Particle identification and sizing using optical and electron microscopes. 5. Cleanroom design and operation. 6. Cleanroom monitoring: Federal Standard 209E. 7. Cleanroom HVAC systems and clean hood design. 8. Particle adhesion and removal from surfaces. 9. Wafer surface scanner and cleaning systems. 10. DI water system and liquid chemicals. 11. Particle behavior under low pressure conditions—process equipment. 12. Special measurement topics: high purity gas and vacuum systems.

COURSE OBJECTIVES	This course is designed to introduce the seniors and graduate students to the technologies of microelectronics cleanroom and particulate contaminant measurement in cleanrooms. Lectures and experiments are designed to familiarize students to issues and techniques for particulate measurement and control in clean manufacturing facility. 1. To teach cleanroom design and operation. 2. To teach principles of cleanroom particle monitors. 3. To learn standards for monitoring cleanroom cleanliness. 4. To learn techniques for identifying and sizing particulate contaminants in cleanroom. 5. To teach principles of optical and electronmicroscopy. 6. To teach cleanroom HVAC systems and cleanhood designs. 7. To teach principles of wafer surface scanners. 8. To learn particulate controls in DI water system and liquid chemicals. 9. To understand particle behavior in process equipment.
COURSE OUTCOMES	**(Letters shown in brackets are linked to program outcomes a-k)** 1. Understand cleanroom design and operational issues. [a, c] 2. Apply cleanroom particle monitors for cleanroom monitoring [b, d] 3. Understand standard test methods for certifying and monitoring cleanrooms. [g, j, k] 4. Apply microscopy and sampling techniques to identify particulate contaminants. [b, d] 5. Understand cleanroom HVAC systems and cleanhood designs [a, c] 6. Apply wafer surface scanners to detect particles on surface [b] 7. Understand contamination issues in cleanroom, DI water system, liquid chemicals and in process equipment [a, c, j, k]
ASSESSMENT TOOLS:	1. Six laboratory reports 2. Two exams: mid-term and final exams

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Nature of Changes:
Benjamin Liu is no longer a course leader. No other changes were made.