Finding Nano – Discovering Nanotechnology and Culture in Germany

SYLLABUS NanoTECH

**COURSE TITLE:** NanoTECH - Nanotechnology in Germany: Implementing Science, Research and Technology in Germany Today

**CATALOG DESCRIPTION:** Technology and research in Germany and Europe today, direct on-site contact with German research centres, direct conversations with leading scientists around Germany in charge of planning today’s research agenda, direct hands-on experience with several laboratory projects themed along nanotechnology.

**LECTURE HOURS:** 30 hours

**REQUIRED TEXTS:** Course-packet provided in class.

**REFERENCE TEXTS:** (none)

**COURSE COORDINATOR:** Matthew Grayson (Northwestern Univ.), Martin Stutzmann, Beate Rattay-Förstl (TUM)

**COURSE GOALS: Nanotechnology:** This course will give students an overview of the technological landscape of Germany, with an emphasis on nanotechnology centres. Laboratory projects related to nanotechnology will be performed in groups with German students. Excursions to industrial sites and research laboratories will lead to a deeper understanding of Germany’s position in the technological world. An introduction to German academic and research environments will deepen awareness of international industrial and scientific collaboration in the modern market. Lectures on intercultural communication and project management will be combined with first-hand visits to technology centres like General Electric Renewable Energy, the EU Patent Office, and Attocube, as well as visits to academic research centres such as the Max-Planck-Institute for Solid State Research in Stuttgart and the Center for NanoScience at the Ludwig-Maximilians-Universität München. Such visits will be highlight topics covered in the lecture course, NanoSCI. (Specific site visit locations are subject to change each year.)

**PREREQUISITES:**
- Electrical Engineering: Quantum Electronics
- Materials Science: Quantum Materials
- Physics: Quantum Mechanics
- Chemistry, Chemical Engineering: Quantum Chemistry
COMPUTER USAGE: None.

HOMEWORK ASSIGNMENTS: Lab assignments, written research reports on site visits.
**PROJECTS:** The students will work with groups of German students on a laboratory project relevant to the fabrication and/or characterization of nanostructures. Students will be able to choose from a variety of lab topics, such as quantum transport through antidots, electron spin resonance, molecular motors, lasers, field effect transistors, electron spectroscopy, atomic force microscopy, diamond field effect transistors. Each laboratory project will be written up as a lab report for evaluation. In addition, the students will also write reports on technology practises observed at several of the sites in Germany visited during this course. Written essays about research topics and practice job applications to various research centers will be graded.

**GRADES:**
Lab reports - 40%  
Site visit research reports - 40%  
Site visit attendance and course participation – 20%

**COURSE OBJECTIVES:** When a student completes this course, s/he should understand nanotechnology by being able to:

• Perform laboratory tasks related to fabrication and characterization in the field of nanotechnology based on direct experience.

• Be specialized in a specific subfield of technology or nanotechnology as demonstrated by written and oral report

• List centres of modern technological development in Germany, and name leading scientists and research programs at those institutions.

• Describe areas of focused activity relating to state-of-the-art technology and nanotechnology.

• Describe how developments subfields in nanotechnology are interrelated

• Explain and take advantage of career opportunities in technological centres in Germany and Europe