

## CBEMS 166 SCIENCE OF NANOSCALE MATERIALS & DEVICES

(Elective for ChE and MSE)

<b>Catalog Description:</b>	<b>CBEMS 166 Science of Nanoscale Materials &amp; Devices (Credit Units: 3).</b> Covers the properties of nanoscale materials and aspects of current research on next-generation electronic devices. Topics include nanofabrication, characterization of nanostructure materials, and device concepts that take the advantage of quantum mechanical phenomena on the nanoscale. Prerequisite: ENGR54 and Physics 7D. Concurrent with MSE266. (Design Unit: 0)
<b>Textbook:</b>	People, C.P. and Owens, F.J. <i>Introduction to Nanotechnology</i> , Wiley & Sons, 2003.
<b>Reference:</b>	DiVentura, M., Evoy, S., and Heflin, J. <i>Nanoscale Science and Technology</i> , Kluwer Academic, 2004. Cao, G. <i>Nanostructures and Nanomaterials</i> , Imperial College Press, 2004. C. Kittel. <i>Introduction to Solid State Physics</i> . John Wiley & Sons, Inc. Kirk, W.P. and Reed, M.A. <i>Nanostructures and Mesoscopic Systems</i> , Academic Press.
<b>Coordinator:</b>	Farghalli Mohamed
<b>Course Objectives:</b>	Nanoscale science and engineering have become an important focus of today's scientific research and has attracted enormous attention. This class will introduce to the students the fundamentals of this interdisciplinary field, stimulate their interest in nanotechnology.
<b>Course Outcomes:</b>	Students will: Understand the synthesis and assembly of nanoscale structures based on top-down and bottom-up approaches. Understand the physical property of nanostructures. Understand the application of nanostructures in designing new electronic, magnetic, and optical devices. Understand about the impact of the emerging field of nanostructured materials on existing engineering problems in global and societal context. Understand that technology is continually evolving requiring continuing education to learn about advances in nano structures and properties. Understand contemporary issues related to nanoscale structures.
<b>Prerequisites by Topics:</b>	Principles of Materials Science, Physics, and solid state physics background.
<b>Lecture Topics:</b>	Brief Review of Solid State Physics Fabrication of nanoscale structures Characterization at the nanoscale Single electron effects Nanoscale electronics

**Course Schedule:** Meets for 3 hours of lecture each week for 10 weeks.

**Computer Usage:**

**Laboratory Projects:**

**Professional Component:** This course is designed to contribute towards the Materials Science Engineering major through the engineering topics that are related to the fundamental of nanoscale materials. Emphasis is placed on nanofabrication and characterization of nanostructured materials.

**Relationship to Program Outcomes:** This course relates to Program Outcomes a, h, i, and j as stated at: <http://undergraduate.eng.uci.edu/degreeprograms/materials/mission>

**Design Content:**

*Approach:*

*Lectures:*

*Laboratory Portion:*

**Grading Criteria:** The following combination of homework sets, and exam will determine grades:

Homework:	20%,
Exam 1:	25%
Exam 2:	35%
Term Paper:	<u>20%</u>
	100%

**Estimated ABET Category Content:**

Mathematics and Basic Science: 0 credit units or 0%

Engineering Science: 3 credit units or 100%

Engineering Design: 0 credit units or 0%

**Prepared by:** Farghalli Mohamed **Date:** July 2007

**CEP Approved:** Fall 2004