

- I. Department, Number, and Title of Course:**
Mechanical Engineering and Energy Processes, ME 465 (3), Introduction to Nanotechnology
- II. Designation as a 'Required' or 'Elective' Course:**
Elective
- III. Course (catalog) Description:**
Survey of the rapidly developing fields of nanometer science and engineering. Impact on society; principles of self-assembly; production and properties of nano-materials; cell mechanism as a model for assemblers; nano-tools; and nano-systems are explored. Laboratory experiments including characterization of nano-materials (HRTEM, HRSEM, AFM, nanoindentation) and preparation of nano-materials for engineering and biomedical applications will be conducted.
- IV. Prerequisite(s):** Chemistry 210
- V. Textbook(s) and/or Other Required Material:**
Introduction to Nanoscale Science and Technology, Di Ventra/Evoy/Heflin
Kluwer Academic Publishers, 2007, ISBN: 1 420 7720
Other supplementary handouts and web pages.
- VI. Course Objectives:**
This course is to serve as an introduction to the broad field of nanotechnology, and the relation to nano-scale engineering and science. The main objective is to familiarize students with the interdisciplinary nature of the subject with more specific attention to materials, methods, and applications. The course is intended to assist students in making career choices and to stimulate their curiosity in the phenomenon that may occur over very small dimensions.
- VII. Topics Covered:**
- a) Introduction and Definition of Nanotechnology with Overview of Current Status and Outlook (2 units)
 - b) Physics and Chemistry of Materials and Nanomaterials (3 units)
 - c) Properties and Geometry of Nanomaterials and Nanostructures (4 units)
 1. fullerenes/carbon nanomaterials, 2. bulk nanomaterials and nanocomposite, 3. nanoscale and molecular electronics, 4. magnetic systems, 5. biological materials
 - d) Nanoscale Fabrication and Characterization (14 units)
 1. lithography, 2. self assembly, 3. quantum wells, wires and dots, 4. methods of measuring properties, 5. processing of nanomaterials
 - e) Nanomachines and Nanomechanics (2 units)
 1. MEMS and NEMS, 2. Sensors
 - f) Environmental Impact of Nanomaterials and Nanotechnology (1 unit)
- VIII. Class/Laboratory Schedule:**
Meets 2 times/week, each period 75 minutes duration.
- IX. Contribution of Homework, Quizzes, Tests, Laboratory Reports, or Research Papers:**
Exam 45%; Homework 30%; Term Paper 25%

**X. Contribution of Course to Meeting the Professional Component:
Medium**

Mechanical Engineers are required to have knowledge of nanomaterials. Course work includes using knowledge of math, chemistry, physics and engineering topics. Students are required work on laboratories and write a term paper on a nanomaterial or application.

Engineering Design: 0 credits (0%) **Engineering Science:** 3 credits (100 %)

XI. Relationship of Course to Program:

Outcome Code	Outcome Description	ME 465
ME-OUT 1	The ability to apply knowledge of mathematics, science and engineering to problem solving	W
ME-OUT 2	The ability to design and conduct experiments, as well as to analyze and interpret data	
ME-OUT 3	The ability to design a system, component, or process to meet desired needs within realistic constraints	
ME-OUT 4	The ability to function on multi-disciplinary teams	
ME-OUT 5	The ability to identify, formulate and solve engineering problems	
ME-OUT 6	An understanding of professional and ethical responsibility	M
ME-OUT 7	The ability to communicate effectively	S
ME-OUT 8	The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context	S
ME-OUT 9	A recognition of the need for and an ability to engage in life-long learning	S
ME-OUT 10	Knowledge of contemporary issues	S
ME-OUT 11	The ability to use the techniques, skills and modern engineering tools necessary for engineering practice	M

S = Strong, M = Medium, W = Weak

XII. Person(s) who prepared this description and date of preparation:

Peter Filip, December 26, 2013

"We emphasize student achievement and success because achievement and success are essential if we are to shape future leaders and transform lives."

Syllabus Attachment

Spring 2014

<http://pvcaa.siu.edu/>

IMPORTANT DATES *

Semester Class Begins.....	01/13/2014
Last day to add a class (without instructor permission):	01/24/2014
Last day to withdraw completely and receive a 100% refund:	01/26/2014
Last day to drop a course using SalukiNet:	03/23/2014
Last day to file diploma application (for name to appear in Commencement program)	03/28/2014
Final examinations:.....	5/5 – 5/9/2014

* Note: For outreach, online, and short course drop/add dates, visit Registrar's Academic webpage

<http://registrar.siu.edu/>

SPRING SEMESTER HOLIDAYS

Martin Luther King, Jr.'s Birthday 01/20/2014

Spring Vacation 03/08—03/16/2014

WITHDRAWAL POLICY ~ Undergraduate only

Students who officially register for a session may not withdraw merely by the stopping of attendance. An official withdrawal form needs to be initiated by the student and processed by the University. For the proper procedures to follow when dropping courses and when withdrawing from the University, please visit

<http://registrar.siu.edu/pdf/ugradcatalog1314.pdf>

INCOMPLETE POLICY~ Undergraduate only

An INC is assigned when, for reasons beyond their control, students engaged in passing work are unable to complete all class assignments. An INC must be changed to a completed grade within one semester following the term in which the course was taken, or *graduation*, whichever occurs first. Should the student fail to complete the course within the time period designated, that is, by no later than the end of the semester following the term in which the course was taken, or graduation, whichever occurs first, the incomplete will be converted to a grade of *F* and the grade will be computed in the student's grade point average. *For more information please visit:*

<http://registrar.siu.edu/grades/incomplete.html>

REPEAT POLICY

An undergraduate student may, for the purpose of raising a grade, enroll in a course for credit no more than two times (two total enrollments) unless otherwise noted in the course description. For students receiving a letter grade of A,B,C,D, or F, the course repetition must occur at Southern Illinois University Carbondale. Only the most recent (last) grade will be calculated in the overall GPA and count toward hours earned. *See full policy at*

<http://registrar.siu.edu/pdf/ugradcatalog1314.pdf>

GRADUATE POLICIES

Graduate policies often vary from Undergraduate policies. To view the applicable policies for graduate students, please visit <http://gradschool.siu.edu/about-us/grad-catalog/index.html>

DISABILITY POLICY

Disability Support Services provides the required academic and programmatic support services to students with permanent and temporary disabilities. DSS provides centralized coordination and referral services. To utilize DSS services, students must come to the DSS to open cases. The process involves interviews, reviews of student-supplied documentation, and completion of Disability Accommodation Agreements.

<http://disabilityservices.siu.edu/>

STUDENT CONDUCT CODE http://policies.siu.edu/other_policies/chapter3/conduct.html

1 Southern Illinois University Carbondale. (2013). *Pathways to Excellence: A Strategic Plan* Retrieved from http://chancellor.siu.edu/common/docs/A_Strategic_Plan.pdf

SALUKI CARES

The purpose of Saluki Cares is to develop, facilitate and coordinate a university-wide program of care and support for students in any type of distress—physical, emotional, financial, or personal. By working closely with faculty, staff, students and their families, SIU will continue to display a culture of care and demonstrate to our students and their families that they are an important part of the community. For Information on Saluki Cares: (618) 453-5714, or siucares@siu.edu, <http://salukicare.siu.edu/index.html>

EMERGENCY PROCEDURES

Southern Illinois University Carbondale is committed to providing a safe and healthy environment for study and work. We ask that you become familiar with the **SIU Emergency Response Plan** and **Build- ing Emergency Response Team (BERT)** programs. Emergency re- sponse information is available on posters in buildings on campus, available on BERT's website at www.bert.siu.edu, Department of Safety's website at www.dps.siu.edu (disaster drop down) and the Emergency Response Guideline pamphlet. Instructors will provide guidance and direction to students in the classroom in the event of an emergency affecting your location. *It is important that you follow these instructions and stay with your instructor during an evacuation or sheltering emergency.*

INCLUSIVE EXCELLENCE

SIU contains people from all walks of life, from many different cultures and sub-cultures, and representing all strata of society, nationalities, ethnicities, lifestyles, and affiliations. Learning from and working with people who differ is an important part of education as well an essential preparation for any career. *For more information please visit:* <http://www.inclusiveexcellence.siu.edu/>

MORRIS LIBRARY HOURS

<http://www.lib.siu.edu/about>

LEARNING AND SUPPORT SERVICES

Help is within reach. Learning support services offers free tutoring on campus and math labs. To find more information please visit the Center for Learning and Support Services website:

Tutoring : <http://tutoring.siu.edu/>

Math Labs http://tutoring.siu.edu/math_tutoring/index.html **WRITING CENTER**

The Writing Center offers free tutoring services to all SIU students and faculty. To find a Center or Schedule an appointment please visit <http://write.siu.edu/>

AFFIRMATIVE ACTION & EQUAL OPPORTUNITY

Our office's main focus is to ensure that the university complies with federal and state equity policies and handles reporting and investigating of discrimination cases. *For more information visit:* <http://diversity.siu.edu/#>

Additional Resources Available:

SALUKINET: <https://salukinet.siu.edu/cp/home/displaylogin>

ADVISEMENT: <http://advisement.siu.edu/>

PROVOST & VICE CHANCELLOR: <http://pvcaa.siu.edu/>

SIU ONLINE: <http://online.siu.edu/>

Spring 2014 R.O'Rourke