George Mason University
Graduate Course Approval/Inventory Form

Please complete this form and attach a copy of the syllabus for new courses. Forward it as an email attachment to the Secretary of the Graduate Council. A printed copy of the form with signatures should be brought to the Graduate Council Meeting. Complete the Coordinator Form on page 2, if changes in this course will affect other units.

Please indicate:  ___X___ NEW  ___ MODIFY  ___ DELETE

Local Unit:  SCS  Graduate Council Approval Date:

Course Designation:  NANO  Course Number:  500

Full Course Title:  Introduction to Nanomaterials and Interactions

Abbreviated Course Title (24 characters max.):  Introduction to Nanomaterials

Credit hours:  3  Program of Record:  Graduate Certificate in Nanotechnology and Nanoscience

Repeatable for Credit?  ___ D=Yes, not within same term  Up to ___ hours maximum
___ T=Yes, within the same term  Up to ___ hours maximum
___ X N=Cannot be repeated for credit

Activity Code (please indicate):  ___X___ Lecture (LEC)  ___ Lab (LAB)  ___ Recitation (RCT)
___ Studio (STU)  ___ Internship (INT)  ___ Independent Study (IND)  ___ Seminar (SEM)

Catalog Credit Format  3: 3: 0  Course Level:  GF(500-600) ___X___ GA(700+)

Maximum Enrollment:  30  For NEW courses, first term to be offered:  S05

Prerequisites:  Admission into the Graduate Certificate in Nanotechnology and Nanoscience.

Catalog Description (35 words or less):  Introduction to nanotechnology. Discussion of the Feynman challenge and its relation to modern science. Applications to nanostructures of charges, currents, diamagnetics, paramagnetics and ferromagnetics.

APPROVAL SIGNATURES:
Submitted by:  ________________________________ email: __________________

Department/Program:  ________________________________ Date: __________________

College Committee:  ________________________________ Date: __________________

Graduate Council Representative:  ________________________________ Date: __________________
Approval from other units:

Please list those units outside of your own who may be affected by this new, modified, or deleted course. Each of these units must approve this change prior to its being submitted to the Graduate Council for approval.

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Course proposal to the Graduate Council
by
The School of Computational Sciences

1. COURSE DESIGNATION:

NANO 500 Introduction to Nanomaterials and Interactions (3: 0: 0)

Prerequisites: Admission into the Graduate Certificate in Nanotechnology and Nanoscience.

Catalog description: Introduction to nanotechnology. Discussion of the Feynman challenge and its relation to modern science. Atoms and states; a review of quantum mechanics; energy levels; excitations. Includes light absorption and luminescence; covalent and hydrogen bonds in nanostructures and polymers; conformations of polymers; random walks; biological nanostructures and bio-inspired self-assembly. Discussion covers collective effects in nanostructures; one-dimensional lattices; delocalization; electron spectrum; proton excitations. Emphasis on two-dimensional and three-dimensional lattices. Applications to nanostructures of charges, currents, diamagnetics, paramagnetics and ferromagnetics.

Course Grading: Standard grading options for a graduate course.

2. COURSE JUSTIFICATION:

Course objectives: To provide students training in Nanotechnology. The students will learn the necessary theoretical background that will help them understand the physics that governs the behavior and applications of nano-size particles and materials.

Course necessity: This course is needed in order to provide students with a solid foundation and background in Nanotechnology, which is a new and emerging area with special demands involving diverse scientific knowledge and background. The course focuses on the interdisciplinary knowledge and training necessary for a successful nanotechnology Scientist/Engineer.

Relationship to existing programs: The proposed course serves as the first in a sequence of classes applicable to the Graduate Certificate in Nanotechnology and Nanoscience.

Relationship to existing courses: No other similar course is currently offered at GMU.

3. APPROVAL HISTORY NA

4. SCHEDULING AND PROPOSED INSTRUCTORS

Time of initial offering: Spring 05

Proposed instructors: Dr. Boris Veytsman or another member of the Nanotechnology faculty.
5. **SAMPLE STUDENT SYLLABUS:**

**NANO 500 Introduction to Nanomaterials and Interactions**

**Text:** References to literature and text segments

John David “Physics of low dimension semiconductors. An introduction”

Ashcroft and Mermin “Solid State Physics”

White,” Introduction to quantum mechanics”

**Tentative Course Content:** NANO 500. Introduction to nanomaterials and interactions

- Week 1: Introduction To Nanotechnology.
- Week 2: Atoms and States
- Week 4: Two-well potential and adiabatic approximation.
- Week 6: Nanostructures and polymers. Twisting and torque.
- Week 7: Conformations of polymers.
- Week 10: Two-dimensional and three-dimensional lattices. Effects of finite lattice size.
- Week 11: Electromagnetism (charges, current, forces.)
- Week 12: Diamagnetics, paramagnetics and ferromagnetics. Applications to nanostructures.
- Week 13: The motion of a nanofilament in electrical and magnetic fields.
- Week 14: Micro- and Nanoelectromechanical systems (MEMS and NEMS).

**Grading:** Assignments: 30%; midterm 30%; Final: 40%