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:  610

Full Course Title:  Nanoelectronics

Abbreviated Course Title (24 characters max.):  Nanoelectronics

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:  NANO 500, 510, 520, and 530, and admission into the Graduate Certificate in Nanotechnology and Nanoscience.

Catalog Description (35 words or less):  Introduces basic elements of nanoelectronic structures, including quantum layers, quantum wires and quantum dots. Covers sub-band structure; transport in quantum layers; behavior in the presence of magnetic fields; Coulomb blockades; CMOS nanodevices and nanoelectronics; and SOI multi-gate device physics and modeling.

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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Graduate Council approval: ___________________________ Date: __________

Graduate Council representative: ___________________________ Date: __________

Provost Office representative: ___________________________ Date: __________
Course proposal to the Graduate Council
by
The School of Computational Sciences

1. COURSE DESIGNATION:

   NANO 610 Nanoelectronics (3: 0: 0)

   **Prerequisites**: NANO 500, 510, 520, and 530, and admission into the Graduate Certificate in Nanotechnology and Nanoscience.

   **Catalog description**: Introduces basic elements of nanoelectronic structures, including quantum layers, quantum wires and quantum dots. Covers sub-band structure; transport in quantum layers; behavior in the presence of magnetic fields; Coulomb blockades; CMOS nanodevices and nanoelectronics; and SOI multi-gate device physics and modeling.

   **Course Grading**: Standard grading options for a graduate course.

2. COURSE JUSTIFICATION:

   **Course objectives**: Students learn the novel physical phenomena that are present in the nanoregime and how they are implemented in the operation of nanoelectronic devices.

   **Course necessity**: This course is needed in order to provide students with exposure to the special physical processes that are operative in nanoelectronic devices. Novel concepts and their implementation in nanodevices are presented.

   **Relationship to existing programs**: The proposed course serves as part of the sequence of classes applicable to the Graduate Certificate in Nanotechnology and Nanoscience. It offers specialized training in nanoelectronics that is not offered in other courses.

   **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. Dimitris Ioannou or another member of the Nanotechnology faculty.
5. **SAMPLE STUDENT SYLLABUS:**

**NANO 610 Nanoelectronics**

**Textbook:**

References to:


Supriyo Datta, “Electron Transport in Mesoscopic Systems”


**Tentative Course Content:**

- Week 1: Basic elements of microelectronic structures
- Week 2: Microelectronics to nanoelectronics
- Week 3: Quantum layers,
- Week 4: Sub-band structure
- Week 5: Physics of quantum wires
- Week 6: Physics of quantum dots
- Week 7: Nanolayers and magnetic fields
- Week 8: Coulomb blockade
- Week 9: CMOS nanodevices
- Week 10: CMOS VLSI and nanoelectronics
- Week 11: SOI devices
- Week 12: Multi-gate device physics and modeling.
- Week 13: Time-dependent quantum mechanics, transport of wave packets, and scattering-matrix techniques for steady state
- Week 14: Scattering-matrix techniques for quantum conductance and resistance for various conducting circuit configurations.

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