Course Syllabus

Course Staff and Office Hours

<table>
<thead>
<tr>
<th>Instructor</th>
<th>Email</th>
<th>Office Hours</th>
<th>Office</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vera Gorfinkel</td>
<td><a href="mailto:vera.gorfinkel@stonybrook.edu">vera.gorfinkel@stonybrook.edu</a></td>
<td>TBD</td>
<td>Chemistry, room</td>
<td>631-632-1131</td>
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Course Description

The major goals and objectives are to provide graduate students with knowledge and understanding of physical background and applications of nanoelectronics. The course will cover electrical and optical properties of materials and nanostructures, fabrication of nanostructures, nanoelectronic devices including resonant-tunneling devices, transistors, and single-electron transfer devices, as well as applications of nanotechnologies in molecular biology and medicine.

Objectives

The course intends to give students a broad understanding of fundamentals, fabrication technologies and applications of nanoscale structures. Students will also be trained for literature study and critique, oral presentation, problem formulation, solution development, and formal writing.

Readings


Content

- Introduction (from classical electronics to nanoelectronics)
- Wave-particle duality, Schrödinger wave equation,
- Materials for nanoelectronics
  - Semiconductors
  - Carbon nanomaterials nanotubes
- Electrons in low-dimensional structures
  - Electrons in quantum wells
  - Electrons in quantum wires
  - Electrons in quantum dots
- Fabrication of nanostructures
  - Crystal growth
  - Nanolithography
  - Clusters and nanocrystals
  - Nanotube growth
  - Characterization of nanostructures
- Electron transport in semiconductors and nanostructures
  - Time and length scales of the electrons in solids
  - Statistics of the electrons in solids and low-dimensional structures
  - Electron transport in nanostructures
- Nanoelectronic devices
  - Resonant-tunneling diodes
  - Field-effect transistors
  - Single-electron-transfer devices
- Nanoelectronics for molecular biology: next generation DNA sequencing

**Grading**

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Attendance</td>
<td>30%</td>
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<tr>
<td>Midterm</td>
<td>20%</td>
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<tr>
<td>Project (execution, report, presentation)</td>
<td>50%</td>
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**Schedule**

TBD

**Disability**

If you have a physical, psychological, medical or learning disability that may impact your coursework, please contact Disability Support Services, 128 ECC Building (631) 632-6748. They will determine with you what accommodations are necessary and appropriate. All information and documentation are confidential.

Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and Disability Support Services. For procedures and information, go to the following web site: http://www.ehs.sunysb.edu and search Fire Safety and Evacuation and Disabilities.

**Academic Honesty**

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person’s work as your own is always wrong. Any suspected instance of academic dishonesty will be reported to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at http://www.stonybrook.edu/uaa/academicjudiciary/

**Conduct**

The University at Stony Brook expects students to maintain standards of personal integrity that are in harmony with the educational goals of the institution; to observe national, state, and local laws and University regulations; and to respect the rights, privileges, and property of other people. Faculty are required to report disruptive behavior that interrupts faculty’s ability to teach, the safety of the learning environment, and/or students ability to learn to Judicial Affairs.