EE206: Nanoscale Characterization Techniques

LEC    Day: MW    Time: 5:10pm-6:00pm    Location: HMNSS 1502
LAB    Location: B144, Bourns Hall, 2-hour session to be determined in the first class

Instructor: Dr. Jianlin Liu
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Tel: (909) 827-7131
Office Hours: 2-3 Tuesdays, and by appointments

Credit: 4 units

Grading: Homework 20%, Mid-term: 20%, Final: 30%, Laboratory report: 30%

Prerequisite: EE201, EE202, EE203 or consent of instructor

Catalog Description:
Primary educational objective of this course is to familiarize the student with the principles of nanoscale materials and devices characterization methods and provide hands on experience in some of these methods. Structural characterization techniques include transmission electron microscopy (TEM), atomic force microscopy (AFM) and scanning tunneling microscopy (STM). Electrical characterization techniques include resistivity, mobility, I-V and C-V of semiconductor materials and devices. Optical characterization techniques include Raman spectroscopy, Fourier transform infrared spectroscopy (FTIR), X-ray diffraction, and photocurrent spectroscopy. Nanoscale characterization laboratory will be set up and this Lab session allows students to operate nanoscale materials and devices characterization tools such as STM etc.

Textbook:
Handouts
Note: some of the materials to be covered in the class lectures are not available in any reference books listed below, please show up in class, take notes and ask questions if any.

References:


# Course syllabus *

<table>
<thead>
<tr>
<th>Week</th>
<th>Dates</th>
<th>Contents</th>
</tr>
</thead>
</table>
| 1    | 3/31, 4/2, 4/4 | Introduction of EE206  
Review: nanostructures and semiconductor devices  
Review: nano-fabrication techniques |
| 2    | 4/7, 4/9, 4/11 | Optical microscopy                                                      |
| 3    | 4/14, 4/16, 4/17 | Scanning electron microscopy (SEM)                                      |
| 4    | 4/21, 4/23, 4/25 | Transmission electron microscopy (TEM)                                   |
| 5    | 4/28, 4/30, 5/2 | Scanning tunneling microscopy (STM)                                     |
| 6    | 5/5, 5/7, 5/9  | Atomic force microscopy (AFM)                                            |
| 7    | 5/12, 5/14, 5/16 | Near-field scanning optical spectroscopy  
**Mid-term exam** |
| 8    | 5/19, 5/21, 5/23 | Electrical characterization I (Resistivity,  
Mobility, Contact resistance, etc)                                      |
| 9    | 5/26, 5/28, 5/30 | Electrical characterization II (I-V, C-V, etc)                           |
| 10   | 6/2, 6/4, 6/6  | Optical characterization I (Ellipsometry,  
Photoluminescence, X-ray diffraction, etc)                              |
| 11   | 6/9, 6/11, 6/13 | Optical characterization II (Raman spectroscopy,  
Infrared spectroscopy, etc)                                             |

**Final exam**  
Lab report due by 5:00pm of final day of final week

* May vary according to actual progress