NANOELECTRONICS AND PHOTONICS (NEP) AREA
Sample Plans of Work for Master of Science Degree
(Non-thesis Option, Nanoelectronics Focus)

Generic Recommendations:
Your undergraduate coursework should probably include a course in quantum mechanics or modern physics, a solid state course describing the device physics of pn junctions, metal oxide semiconductor field effect transistors (MOSFETs), bipolar junction transistors (BJTs), lasers, other semiconductor devices and quantum mechanics (or modern physics). A strong background in electromagnetic theory is also helpful. If you do not have this background, don't despair of a career in nanotechnology, but recognize that some supplemental work may be needed.

The normal entry sequence is in the Fall semester of the academic year. Students transferring in the spring semester are recommended to get specific advice from their interim advisors. Specifically, it may be useful to take PY 552, if ECE 530 is not offered.

In the nanoelectronics and photonics area a Masters with Thesis is preferred. For experimentalists this is due to the complexity of the equipment involved in the growth, fabrication and characterization of the semiconductor or nanostructured materials. It is very valuable to have hands on experience using the tools that can only be obtained by actively participating in research. For students with a more theoretical bent a thesis is encouraged to permit the in-depth analysis of specific problems of interest. A detailed explanation of the rules can be found in the graduate handbook.

ECE graduate students are allowed to take a certain number of courses offered outside the ECE department. NEP graduate students usually take these courses from Mathematics, Physics or Materials Science and Engineering Departments.

Breadth and Depth Requirements

The following courses are recommended to achieve both breadth and depth in this field.

Breadth Choices

To satisfy the breadth requirements, NEP students are expected to take 3 courses from 3 of the 4 specialties listed below

- One course from NEP – ECE 530 Physical Electronics (required)
- Take two courses from the three specialties listed below (one each)
    - Very Large Scale Integration
        - ECE 546 – VLSI Systems Design
        - ECE 520 – Digital ASIC Design
    - Electronic Circuits
        - ECE 511 – Analog Electronics
        - ECE 733 – Digital Electronics
    - Microwave Circuits & Applied Electromagnetics
        - ECE 540 – Electromagnetic Fields

Depth Choices

To satisfy the depth requirement, NEP students are expected to take two of the 700 level courses listed below:

- ECE 722 – Electronic Properties of Solid State Materials
- ECE 723 – Optical Properties of Solid State Materials
- ECE 724 – Electronic Properties of Solid State Devices
- ECE 725 – Quantum Engineering
- ECE 727 – Semiconductor Thin Film Technology
- ECE 729 – Growth of Thin Films from the Vapor Phase
- ECE 737 – Characterization of High Speed Devices
- ECE 739 – Integrated Circuits Technology and Fabrication Laboratory

Other NEP Electives

- ECE 523 – Photonics and Optical Communications
- ECE 528 – Semiconductor Characterization
- ECE 531 – Principles of Microwave Devices
- ECE 538 – Integrated Circuits Technology and Fabrication
- ECE 553 – Semiconductor Power Devices
- ECE 557 – Principles of MOS Transistors

Outside Department Course Options (up to 3 courses)

- MA 501 – Advanced Mathematics for Engineers & Scientists I
- MA 502 – Advanced Mathematics for Engineers & Scientists II
- PY 552 – Introduction to the Structure of Solids
- PY 501 – Quantum Mechanics I
- MSE 760 – Materials Science in Processing of Semiconductor Devices
- MSE 704 – Electrical, Optical and Magnetic Properties of Materials

Sample Plans of Work

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1st semester (Fall)	ECE 530	ECE 530
	ECE 538	ECE 538
	ECE 546	MA 501
2nd semester (Spring)	ECE 546	ECE 540
	PY 552	PY 552
	ECE 724	ECE 724
3rd semester (Fall)	ECE 557	ECE 557
	MA 501	ECE 722
	ECE 511	ECE 511
4th semester (Spring)	ECE 520	ECE 723
	ECE 533	ECE 553
	ECE 739	MSE 704