

EEE532: Semiconductor Device Theory II

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Textbook: S. M. Sze and Kwok K. Ng, *Physics of Semiconductor Devices* – Third Edition, John Wiley & Sons, Inc., 2007. (I will not follow closely this book. I will provide you appropriate reading material when needed.)

Prerequisite:

EEE531 or equivalent. Knowledge of quantum mechanics (quantum confinement, tunneling, etc.) is desired but not needed.

Objectives:

Gain deeper and broader knowledge of semiconductor device physics and device operation principles by covering special topics.

Topics covered:

1. *Heterojunction Devices: Heterojunctions Fundamentals, Heterojunction Field Effect Transistors (HEMTs), Heterojunction Bipolar Transistors (HBTs) (3 weeks)*
2. *Charge-Coupled Devices (1.5 weeks)*
3. *Memories (1 week)*
4. *Thin film Transistors (0.5 weeks)*
5. *MESFETs and JFETs (1 week)*
6. *Optoelectronic Devices: Photodiodes, Light Emitting Diodes, Lasers, and Solar Cells (3 weeks)*
7. *Microwave Transistors, Tunnel Diodes, IMPATT's, Transferred-Electron Devices (3 weeks)*
8. *Nano-Electronics Devices (1 week)*

Course requirements:

Grading will be based upon successful completion of 6 – 8 projects. The projects will involve MATLAB programming, use of Silvaco simulation software and use of nanoHUB tools.

Grades:

$95 \leq A+ \leq 100$; $90 \leq A < 95$; $85 \leq A- < 90$; $80 \leq B+ < 85$; $75 \leq B < 80$; $70 \leq B- < 75$; $C < 70$