

*NCN@Purdue Summer School: July 14-25, 2008*

## Electronics from the Bottom Up

### Physics of Nanoscale Transistors

Mark Lundstrom  
Network for Computational Nanotechnology  
Discovery Park, Purdue University  
July 21-25, 2008

#### **COURSE HANDOUTS**

Lecture Schedule

Course Introduction

Lecture 1: Review of MOSFET Fundamentals  
Lecture 1 Exercises

Lecture 2: Elementary Theory of the Nanoscale MOSFET  
Lecture 2 Exercises

Lecture 3A: Theory of the Ballistic MOSFETs  
Lecture 3A Exercises

Lecture 3B: Theory of the Ballistic MOSFETs  
Lecture 3B Exercises

Lecture 4: Carrier Scattering in Nanoscale MOSFETs  
Lecture 4 Exercises

Lecture 5: Application to State-of-the-Art MOSFETs  
Lecture 5 Exercises

Lecture 6: Quantum Transport in MOSFETs  
Lecture 6 Exercises

Lecture 7: Connection to the Bottom Up Approach

References

Notes on Fermi-Dirac Integrals, 2<sup>nd</sup> Ed.

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## *Week 2*

Monday-Thursday all lectures will be given by Lundstrom.  
Friday's lectures will be given by Alam

All lectures will be held in Rawls Hall, Room RAWLS 2070  
Computer labs will take place in Stanley Coulter, Room SC 289

### **Monday, July 21:**

9:30 AM	Physics of Nanoscale Transistors: Course Introduction
9:45 AM	Lecture 1: Review of MOSFET Fundamentals
10:30 AM	BREAK
11:00AM	Question and Answer Session
1:30 PM	Lecture 2: Elementary Theory of the Nanoscale MOSFET
2:30 PM	BREAK
3:00 PM	Questions and Answers
4:30 PM	Computer Lab

### **Tuesday, July 22:**

9:30 AM	Lecture 3A: Theory of Ballistic MOSFETs
10:30 AM	BREAK
11:00AM	Question and Answer Session
1:30 PM	Lecture 3B: Theory of Ballistic MOSFETs
2:30 PM	BREAK
3:00 PM	Questions and Answers
4:30 PM	Computer Lab

### **Wednesday, July 23:**

9:30 AM	Lecture 4: Scattering in Nanoscale MOFETs
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10:30 AM BREAK  
11:00AM Question and Answer Session  
  
1:30 PM Lecture 5: Application to State-of-the-Art MOSFETs  
2:30 PM BREAK  
3:00 PM Questions and Answers  
  
4:30 PM Computer Lab

**Thursday, July 24:**

9:30 AM Lecture 6: Quantum Transport in MOSFETs  
10:30 AM BREAK  
11:00AM Question and Answer Session  
  
1:30 PM Lecture 7: Connection to the Bottom Up Approach  
2:30 PM BREAK  
3:00 PM Questions and Answers  
  
4:30 PM Computer Lab

**Friday, July 25:**

9:30 AM Lecture 1: Percolative Transport in Electronic Devices  
10:30 AM BREAK  
11:00AM Lecture 2: Basic Concepts: Thresholds, Islands, and Fractal Dimensions  
12:00-12:30 Questions and Answers  
  
1:30 PM Computer Lab