# VLSI Workshop Day 4

## Today’s Topic: Research in Education

<table>
<thead>
<tr>
<th>TIME</th>
<th>DAY 1</th>
<th>DAY 2</th>
<th>DAY 3</th>
<th>DAY 4</th>
<th>DAY 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00</td>
<td>common session</td>
<td>common session</td>
<td>common session</td>
<td>common session</td>
<td>common session</td>
</tr>
<tr>
<td>9:30</td>
<td>Introduction: VLSI Curriculum; Course Content Overview</td>
<td>Course content: technology &amp; device models</td>
<td>Teaching skills; effective lectures</td>
<td>DIS: Research in Education</td>
<td>DIS: Engaging in Research</td>
</tr>
<tr>
<td>10:00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>New tech. resources</td>
</tr>
<tr>
<td>10:30</td>
<td>Components of VLSI Course</td>
<td>Course content: CMOS logic, layout, sequential logic</td>
<td>Teaching resources; effective homework, exams, labs</td>
<td>Trends in VLSI</td>
<td>Research: MEMS &amp; Sensors</td>
</tr>
<tr>
<td>11:00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>VLSI Implementations of DSP</td>
</tr>
<tr>
<td>11:30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Research: Bio-medical Electronics</td>
</tr>
<tr>
<td>12:00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:30</td>
<td>lunch</td>
<td>lunch</td>
<td>lunch</td>
<td>lunch</td>
<td>lunch</td>
</tr>
<tr>
<td>1:00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:30</td>
<td>common session</td>
<td>common session</td>
<td>common session</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2:00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2:30</td>
<td>Components of VLSI Course</td>
<td>Advanced/grad topics &amp; courses</td>
<td>BOG: Session A</td>
<td>BOG: VLSI Course Content Lectures</td>
<td>BOG: New Technology Lectures</td>
</tr>
<tr>
<td>3:00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3:30</td>
<td>DIS: What BOGs do you want?</td>
<td>DIS: Challenges to Teaching VLSI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4:00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4:30</td>
<td>DIS: Break Out Groups &amp; Lectures</td>
<td>BOG: Session B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5:00</td>
<td>Questionnaire</td>
<td>Course Lecture</td>
<td>Course Lecture</td>
<td></td>
<td>New Tech Lecture</td>
</tr>
</tbody>
</table>
Day 4 Agenda

Morning
• Reminder: Present lectures this afternoon
  • email slides to dr.a.mason@gmail.com; include group # in file name
• Questions from Day 3?
• Discussion: Research in Education
• Resources for new technology information
• Current trends in VLSI research
  • low power design
• Research: VLSI Implementation of DSP Algorithms

Afternoon
• Break-out Group: Present brief VLSI Design course lectures
• Discussion: Engaging in Research

Overnight Assignment
• Prepare ‘new technology’ presentation
Role of Research in Education

Why should you consider engaging in research?

- Keep up-to-date with science/engineering advances
  - research requires you to work at the cutting edge
  - adds a challenge that keeps the job interesting
- Convey cutting-edge concepts to students
  - transfer your knowledge of new technology during lectures
  - helps maintain student interests
- Provide students with research experience
  - undergraduates and graduates can participate
- Help train next-generation workforce
  - student researchers learn state-of-the-art material/skills
  - student researchers learn to work/think independently
Discussion: Research in Education

List other benefits of engaging in research

• making contacts; networking
• contribute to technology evolution
  • improve national economy; worldwide lifestyle
• improves reputation
• improves infrastructure of university
• IP for you and university
• keep you forward thinking
• improve society
• evolution of curriculum
Discussion: Research in Education

**Your** challenges to engaging in research
• little credit (from university) for research
• limited government funding for research to lower-tier universities
• weak library infrastructure
• difficult to attract good students
  • can not attract students from outside India
• difficulty establishing collaborations

**Solutions**
• try to get publications to establish reputation
  • work through collaborations
Resources for New Technology

• Finding a worthwhile research topic is half the battle
• Where can you look?
  • read journal papers
    • IEEE Explore: http://ieeexplore.ieee.org
    • ISI Web of Knowledge: http://www.isiwebofknowledge.com/
      • requires university participation (fee)
  • search internet
    • many people post their own papers
  • attend professional conferences
    • see what others are doing
  • meet with potential industry/university collaborators
    • “What problems do you need solved?”
    • What do you have to offer?
      • your expertise and time
      • your students, i.e. cheap labor
  • read trade magazines
Current Trends in VLSI

- Electronic Design Automation
  - analog HDL
- Built-in Self Test, Self Repairing Circuits, Fault Tolerance
- Microprocessor & System on Chip Architecture
  - energy efficient or ultra fast controllers
  - mixed-signal/function chips; sensor/lab on chip
- Digital Circuit Applications
  - power efficient signal processing
  - high speed computation & networking
- Digital Circuit Design
  - low voltage/power circuits, e.g. microprocessors, memory
- VLSI Technology
  - fabrication techniques for deep submicron
  - next-generation devices and gate structures
  - power vs. size scaling
  - micro-electro-mechanical systems
Research Topics

Time permitting, we can discuss my research in these areas:

- Low Power Design Techniques
- Low Power VLSI Implementation of DSP Algorithms: Neural signal processing example
- Analog/Mixed-Signal Design: Sensor readout circuits
- Micro-Electro-Mechanical Systems (MEMS) and Sensors
- Bioelectrochemical System on a Chip

Slides for all topics posted on workshop website
BOG: Present VLSI Design Lectures

• Form break-out groups now
• Present lectures to your group
  • ~10 min presentation (someone keep track of time)
  • ~5 min discussion
    • first identify positive elements
    • then give critical evaluations; note things you should work on
• Take a 5 min break after ~1/2 of the presentations
• Meet back here for final Day 4 discussion
  • set time to meet __4:00 (after 3:45 tea break)___
• Questions?
Discussion: Summary of BOG

• What positive feedback did you get?
  •
  •
• What constructive criticism did you receive?
  •
  •
• What can you do to improve on weaknesses?
  •
  •
• Overnight Assignment: Read a VLSI-related research (new technology) paper and present it (~5 min with ~2 min for discussion) to your BOG tomorrow