

# VLSI Workshop Day 4

## • Today's Topic: Research in Education

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

# Day 4 Agenda

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## Morning

- Reminder: Present lectures this afternoon
  - email slides to [dr.a.mason@gmail.com](mailto: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

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## 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

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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

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**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

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# Resources for New Technology

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- 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

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- 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

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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

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- 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

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- What positive feedback did you get?
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  - .
- 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