• **Today’s Topic: Effective Teaching**

<table>
<thead>
<tr>
<th>DAY 1</th>
<th>DAY 2</th>
<th>DAY 3</th>
<th>DAY 4</th>
<th>DAY 5</th>
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</thead>
<tbody>
<tr>
<td>9:00</td>
<td>common session</td>
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<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>
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<td>10:00</td>
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<td>DIS: Engaging in Research</td>
<td>DIS: Engaging in Research</td>
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<td>10:30</td>
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<td>DIS: New tech. resources</td>
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<td>11:00</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>
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<td>11:30</td>
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<td>VLSI Implementations of DSP</td>
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<td>12:00</td>
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<td>Research: Bio-medical Electronics</td>
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<td>lunch</td>
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<td>2:00</td>
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<td>2:30</td>
<td>Components of VLSI Course</td>
<td>Advanced/grad topics &amp; courses</td>
<td>BOG: VLSI Course Content Lectures</td>
<td>BOG: New Technology Lectures</td>
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<td>3:00</td>
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<td>3:30</td>
<td>DIS: Challenges to Teaching VLSI</td>
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<td>BOG: Session A</td>
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<td>4:00</td>
<td>DIS: What BOGs do you want?</td>
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<td>DIS: BOG</td>
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<td>4:30</td>
<td>DIS: Break Out Groups &amp; Lectures</td>
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<td>BOG: Session B</td>
<td>DIS: Summary &amp; Action Items</td>
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<td>5:00</td>
<td>Questionnaire</td>
<td>Course Lecture</td>
<td>Course Lecture</td>
<td>New Tech Lecture</td>
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Day 3 Agenda

Morning
• Reminder: Prepare lectures for tomorrow
• Questions from Day 2?
• Presentation skills
• Effective lectures
• Effective homework, exams, and labs

Afternoon
• Break-out Group: Session A
• Break-out Group: Session B
• Industry perspective (Dr. M.P. Ravindra, Infosys)

Overnight Assignment
• Prepare lecture presentation: topic selected yesterday
Presentation Skills

Effective class lectures require presentation skills that can be learned

• Outline
  • Video on “How to Speak”
  • Discuss video
  • My own lecturing tips
  • Practice in break-out groups tomorrow

• Make our own list of lecturing tips
  • Before watching video
  • After watching video
  • Record list to post on workshop website
Our Lecture Tips (Before Video)

Describe some of your lecturing tips

• set objective(s) for each lecture with relevance to students
• plan and practice
• motivate student
  • interactive with students - get to know your students
  • ask questions/summary
  • case studies, demonstration
  • props, teaching aids
• review past lectures, repeat important ideas
• provide reference/resource material
• introduce upcoming lectures/topics

•
•
Video: How to Speak

• Professor Patrick Winston, Massachusetts Institute of Technology, “How to Speak” (1997)
  • Derek Bok Center for Teaching and Learning (Harvard)
  • http://isites.harvard.edu/fs/html/icb.topic58703/winston1.html

• Take notes on key points you consider useful & those you disagree with

• Watch videos
Our Lecture Tips (After Video)

Describe video points you agree (or disagree) with
• ok to be eccentric
• salute audience
• eye contact, read audience reactions
• humorous stories
• hand gestures and body language
• blackboard use/management
•

What other element could you use in your “Big 4”?
• hand gestures and body language
•
Video: Some Take-Home Points I Noticed

• Questions should be answerable
• Wait for answer to questions (5 second rule)
• Pace set by using blackboard vs. using slides
• Speaker used real world examples (“stories”) to support most of his points
  • e.g., cannon ball, skier, instructor’s tie
• Pose a question to get questions started
• Use of known techniques can add confidence to speaker
• Relate lecture to things audience already knows
“How To Speak” Outline

• How to Start
  • (don’t Joke)
  • Promise
  • Menu
• The Big Four
  • Cycle (repeat)
  • Verbal punctuation
  • Near miss
  • Ask question
• Time & Place
  • 10 or 11am
  • Well lit
  • Full
• The Blackboard
  • Draw
  • List
  • Target
• Overheads

• Props
• Style
  • (don’t Copy)
  • Adapt
  • Eccentric
  • Story
• How to End
  • (don’t Thank)
  • Joke
  • Deliver (remind of promise)
  • Ask for Questions
  • Salute
• Questions
  • Ask a question
  • Non-verbal communication
  • Conversation vs. lecture
  • Use of slides
  • Being nervous
My Lecturing Tips I

• Attitude
  • you must show you are interested in the material

• Delivery
  • Tone
    • don’t be monotone; alter pace and inflection
  • Engagement
    • critical for effective lectures to students; keep students involved
    • ask answerable questions; wait for answers
    • use stories and examples to alter pace
    • have students come to blackboard to solve example problems
    • do not overly complicate issues; teach what they need to know
  • Repeat important concepts; in different ways if possible

• Examples & Story
  • create examples to demonstrate how principles can be applied or equations can be used
  • develop stories (real live analogy) to relate some concepts each lecture
    • example: describe diffusion
My Lecturing Tips II

- Aids
  - Slides
    - teaching VLSI requires complex diagrams and schematics
    - slides very helpful
    - if all lecture material on slides, provide slides to class
    - if providing slides, add details beyond bullets so students can study from slides
    - consider leaving some information off handout slides so students can fill in the blanks as you speak
      - works especially well for examples
    - slides provide a lot of information quickly; take care not to go too fast
  - Props
    - materials and tools of the trade will be new to students
    - creates interest and feeling of value in real life
    - examples
      - silicon wafers, photomasks, chips under microscope, chip layout plots
      - industry contacts useful to supply good props
My Lecturing Tips III

• Answering questions
  • be concise; encourage more participation in limited time
  • don’t be afraid to say ‘I don’t know’
    • try to come back the next day with answer
    • encourage student to find answer and report back; builds confidence
  • avoid asking students if they can answer another student’s question

• Managing time
  • cover only the material you can cover thoroughly
    • poorly explained concepts will not stick with students beyond class
  • allow time for and encourage questions
    • but do not let questions delay your schedule; answer concisely
    • postpone complex answers until after class - but do answer them
  • never complain about being behind; it’s your job not theirs
Tips on Homework

• ensure assignment length matches expected time out of class
  • account for lab also
• focus on important concepts
  • do not create “busy work”
  • reinforce the importance of homework concepts in class
    • helps students feel their time on homework is valuable
• start with 1-2 easy to solve problems
  • find right equation; insert parameters; calculate
  • helps students build confidence before tackling harder problems
  • break problems into easy to understand steps; walk them through the problem
• advance toward more complex problems
  • integrate multiple concepts into one problem
  • add ‘given’ parameters that are not needed to solve problem
• homework is good for developing a feeling for expected magnitude of parameters
  • ensure your problems/answers have proper magnitudes
• unit conversion/matching often challenge students
  • require proper units for answers
  • teach how to do unit conversions (e.g., cm³ → um³) and know metric units
Tips on Exams

- much of VLSI Design is concepts rather than problems
- my exam format
  - 50% split of concept questions (T/F, multiple choice)
  - 50% calculation problems
    - based on homework, but not copied from
    - example exam posted on workshop website
- simplify grading
  - T/F & multiple choice easy to grade
    - but not effective for entire exam
  - do not allow mistakes to carry forward
    - break problems into steps
    - provide new parameter values: “assuming that Y = 3 in part (a)…”
    - provide lines/boxes for answers & require specific units
- minimizing cheating
  - different exams; or print in different colors to appear different
  - honor pledge
  - monitor exam
- editing: thoroughly proofread exam to eliminate mistakes
  - gives impression you have not put as much effort in as students have studying
Do you still have questions on any of these issues?

- how to establish an open environment where students can ask questions
- how to break the ice in the classroom so that there is participation by the class
- how to answer questions
- how to be concise yet to the point
- how to make powerpoint slides
- how to let the audience know what part of the slide you are talking about
- how to explain "difficult" material
- how to use the laser pointer
- how to use figures
Learning Resources

- My website for writing and presenting
  - http://www.egr.msu.edu/~mason/writing.htm
    - tips from me and links to many others, including IUCEE presenters
- Others that you know of?
  - 
  - 
  - 
- Interest in forming a teleconferencing meeting group for workshop participants?
Workshop Assessment

• Importance of assessment in your class

• Are you enjoying and learning from the workshop?
• If not, why?
  •
  •

• What would you like to see added to or removed from the workshop schedule?
  •
  •
  •
  •
Day 3 afternoon Break Out Groups

• Break into groups based on topic interest
  • Session A (pick one)
    • Preparing homework
    • Developing final year projects
    • Establishing relations with industry
    • Getting chips fabricated/tested
  • Session B (pick one)
    • Setting up VLSI lab assignments
    • Developing PG projects
    • Engaging in research
    • Evolving/expanding curriculum

• Form break-out groups now
• Questions?
Example BOG: Homework Problems

• Discuss challenges to incorporating homework in your course
• Prepare a homework problem: 20-30 min
  • include figures, schematics, etc.
• Present your problem to your BOG: 5 min each
• Receive positive feedback and criticism: 5 min each
Industry Perspective

How can Indian instructors engage with industry?

• How to seek potential student employers to discuss curriculum and course content from industry perspective?
  •

• How to seek faculty/industry exchange opportunities?
  •

• How to establish relationships leading to research?
  •

• Others?
  •
Day 3 Wrap-Up

• Reminder: brief lecture presentations tomorrow
  • Overnight assignment: prepare presentations; consider what you have learned today

• My homework; make sure we have rooms for BOGs tomorrow afternoon