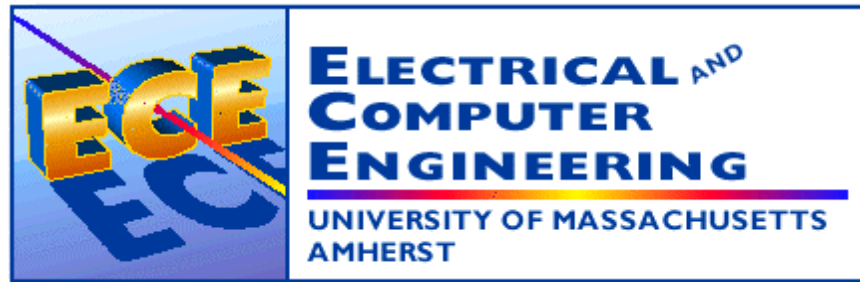


Introduction to Computer Engineering



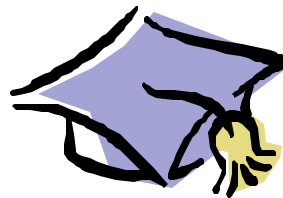
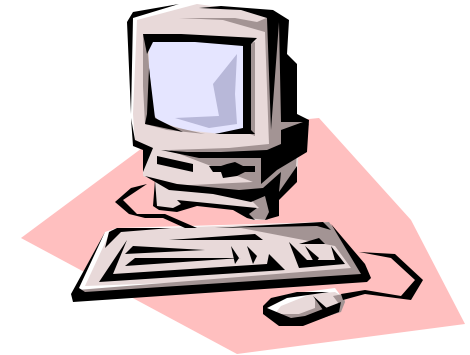
Professor Tessier - Career Choices

- Age 8 - astronaut
- Age 12 - baseball player
- Age 16 - computer scientist
- Age 21 - computer engineer
- Age 31 - computer engineer/professor
- Age 41 - park ranger?



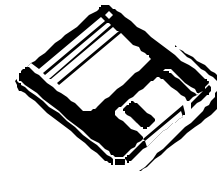
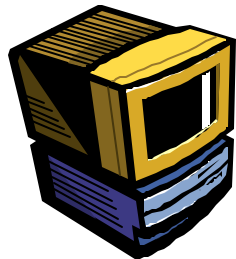
Why Computer Engineering?

- Afraid of heights
- Couldn't hit curveball
- Wanted to impress friends/parents
- Fascinated by computers
- Hoped to make a good living
- Lots of opportunities in Massachusetts



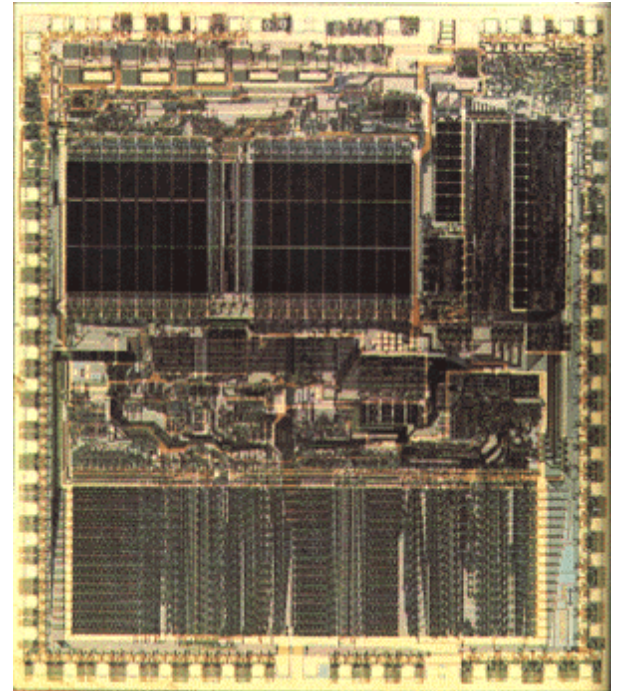
Computer Engineering

- ◉ All about designing and building computers
 - Silicon chip design
 - Combining chips into systems
 - Combining systems into networks
 - Helping systems recover from failure
 - Software design to help computers run faster and more efficiently



Integrated Circuit Design

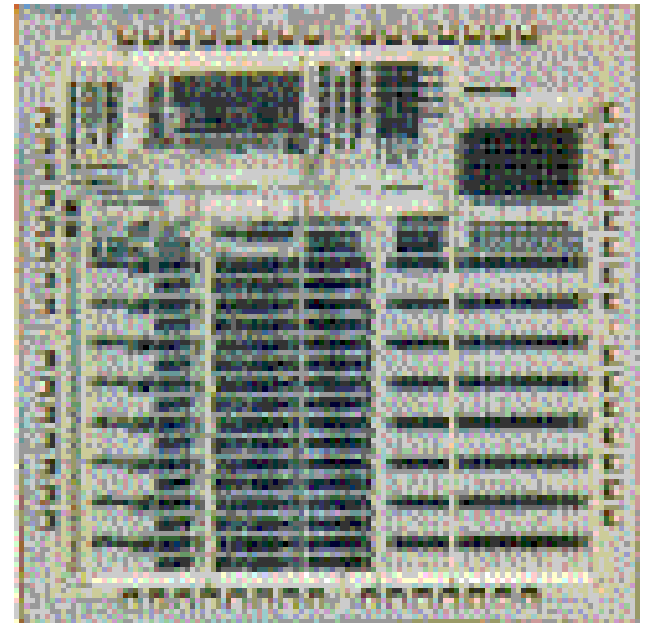
- Involves physics
- Learn to work in teams
- Interact with software designers
- Requires skill, patience
- Learn to use advanced CAD tools



MC68000 die photo: circa 1979
courtesy: The Computer Museum

VLSI Signal Processing

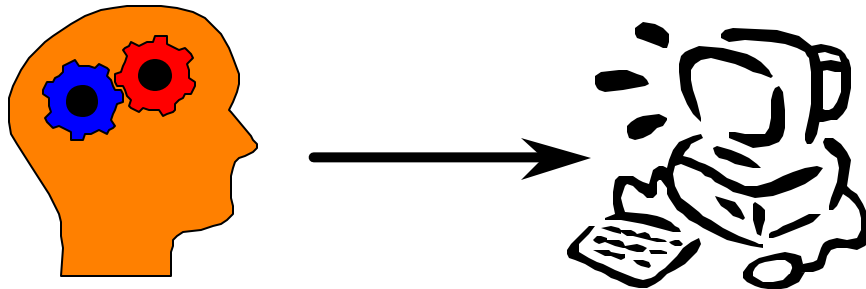
- Research supervised by Professor Burleson
- Chips process analog signals (video, audio)
- Important issues: power, performance
- Chip design a valuable skill as chips become larger



Scheduling Co-processor

Computing Systems

- Making chips work together to solve problems (memories, processors, etc.)
- Understanding the problems to be solved
- Interfacing with chip designers and programmers
- Learning the science of computer design (models, implementation)



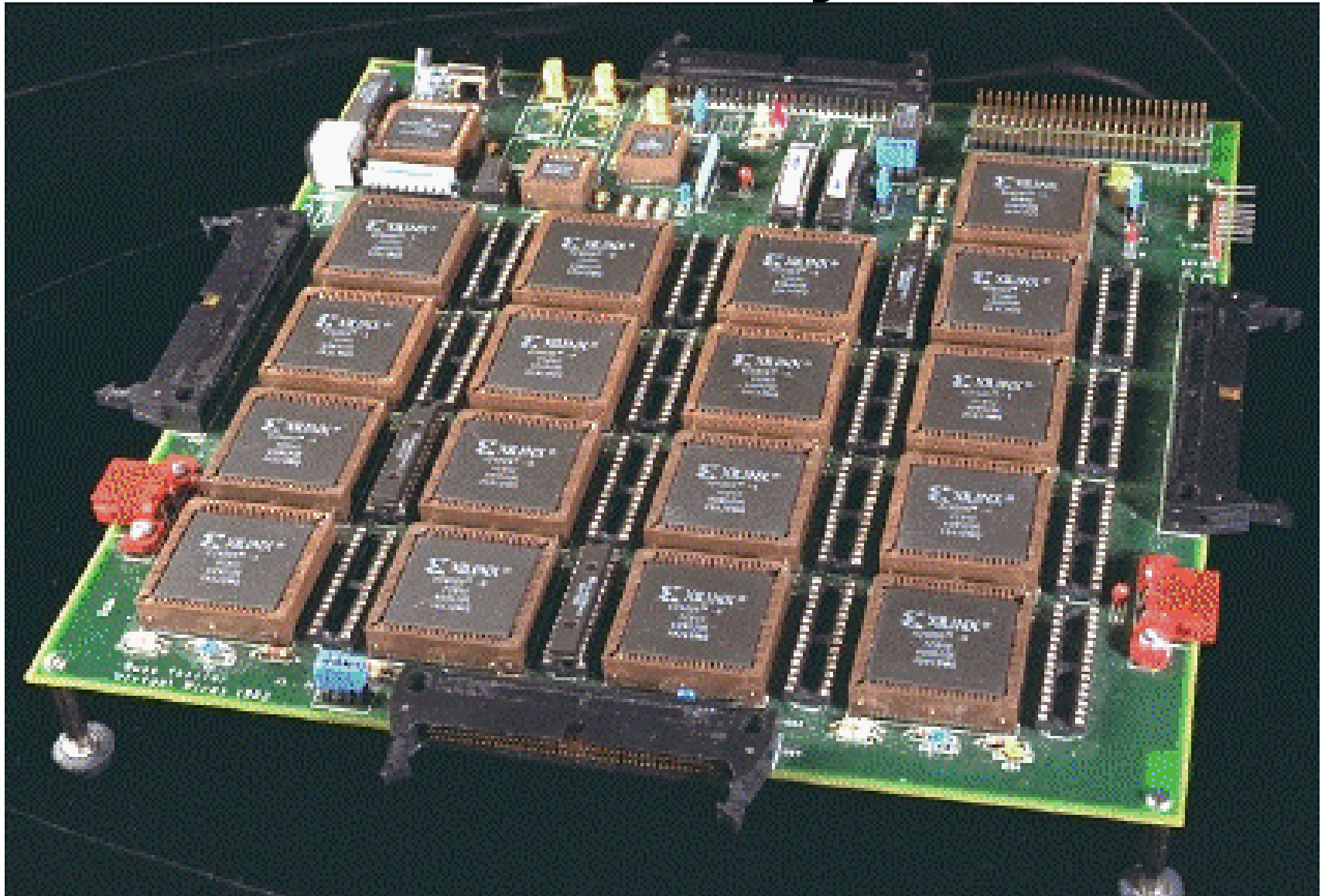
Reconfigurable Computing Group

- Professor Tessier
- Interested in using chips that change their functionality
- Possible to connect multiple chips together to form a system
- New challenges in software.
How often should it change?



Field- programmable
gate array

Multi-FPGA System



Computer Networks

- Develop techniques for computers to communicate (software/hardware)
- Especially important for multimedia
- Communication made through protocols
- Reliability is especially important
 - ensure data received successfully
- Need for mathematical modelling



Multimedia Networks Lab

- Professor Ganz
- Techniques for reliable data transport
 - Is this what I expected?
- Wireless networks of computers
 - no more ugly cables?
- “Real-time” communication
 - I need it now!
- Software security
 - no peeking!



Computer Fault Tolerance

- Professors Koren and Krishna
- Test computers to determine problems
- Notify user if problem identified
- Automatically fix problem if possible
- Often fix involves use of redundant hardware
- Clever programming techniques can also be used



Software Engineering



- Graphical design and image processing
- World wide web - new search techniques
- Communication protocols - how can we compress data into smaller sizes
- Compilers - is it possible to take advantage of new chips/architectures.
- Design automation - Building systems is complicated. Can an existing computer help?

Netscape  Netcenter™

Computer Education

- On-line learning
- Engineering the interface
- Making it interactive
- Group effort

The screenshot shows a Netscape browser window titled "Manic CourseWare - Netscape". The main content area displays "Slide #67" with the title "UMass Chips". The slide features a hand-drawn diagram on a grid background. The diagram shows a rectangular component labeled "Metal 2" with a width of 5000μ . It is connected to a $V_{DD} = 5V$ supply on the left and another V_{DD} supply on the right. A hand is pointing to the right V_{DD} connection. Below the diagram is a photograph of a black chip carrier with several integrated circuits. A red arrow points from the diagram to one of the chips in the carrier, with a label "1cm" indicating scale. The slide also includes a copyright notice: "© 1998, University of Massachusetts".

Slide #67
UMass Chips

$V_{DD} = 5V$ 5000μ V_{DD}

Metal 2

1cm

© 1998, University of Massachusetts

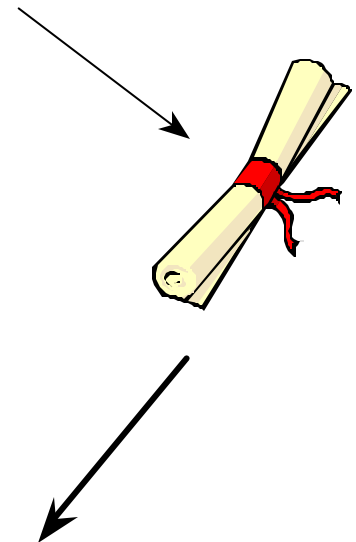
Recommended Skills

- Basic understanding of circuits
- Knowledge of how a computer works
- Solid basis in mathematics/algorithms
- Programming knowledge
- Patience/perseverance
- Enthusiasm for the topic

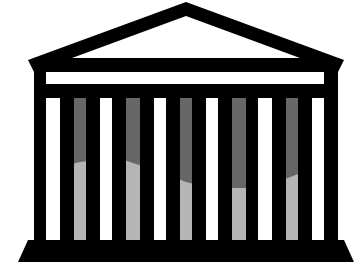


Your First Job

- Software developer
- Web page designer
- Integrated circuit engineer
- Quality control engineer
- Engineering manager
- Marketing engineer



Graduate School?



- Learn to do research
- Explore advanced topics
- Master's degree - short term project (2 years)
- Doctoral degree - longer term project (4-5 years)
 - innovative research
 - become a professor?
- Technology changes rapidly - requires constant learning

Summary

- Many opportunities for computer engineering majors at UMass
- Undergrad classes prepare students for industry and grad school.
- In addition to classes, opportunities exist for undergraduate research.
- Lots of exciting things happening. Check out our web pages!

