Discover Viterbi: Electrical and Computer Engineering

with

Prof. Richard Leahy & Prof. Tony Levi

Viterbi School of Engineering
University of Southern California

Spring 2019

USC Viterbi School of Engineering | USC University of Southern California

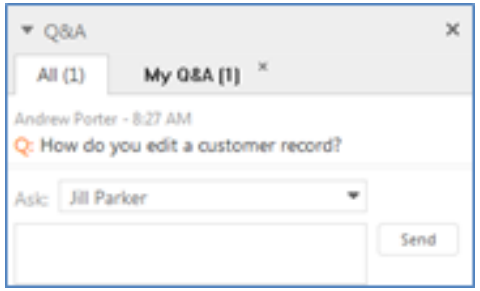
WebEx Quick Facts

Will I be able to get a copy of the slides after the presentation?

YES!

How can I ask a question during the information session?

1. Using the Q&A Panel, type a question in the box below the Ask drop-down menu.
2. Select a recipient from the Ask drop-down menu.



3. Click Send. We will respond as soon as we are able.

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Today's Program

- University of Southern California
- USC Viterbi School of Engineering
- Graduate Programs in Electrical & Computer Engineering
  - Program Overview
  - Application Criteria
- DEN@Viterbi
- Tuition & Fees
- Q&A

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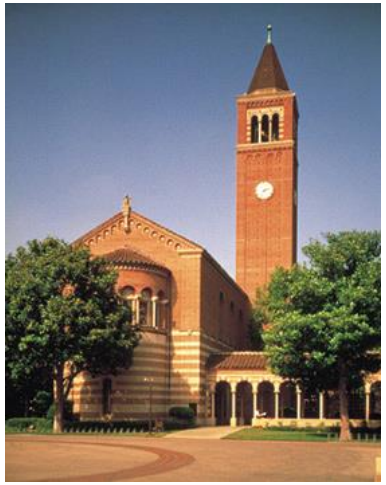

UNIVERSITY OF SOUTHERN CALIFORNIA

USC Viterbi
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The University of Southern California

- Oldest Private University in the western U.S.
  - Founded in 1880
- 47,500 Students
  - 20,000 Undergraduates | 27,500 Graduates
- 4,451 Full-time Faculty
- Diverse Student Population
- Located in Los Angeles

USC Viterbi
School of Engineering

Viterbi School at a Glance

Academic Departments

- 8 Academic Departments

Faculty

- 188 tenure-track faculty
- 16 Full-time, TT NAE Members (30 Total)
- 70+ NSF CAREER, National & Presidential Young Investigator

Student Populations (Fall 2018)

- 2,767 Undergraduate
- 5,922 Graduate students

Research

- Leader in funded research
- 35+ Research Centers
- More than $207M in research expenditures annually

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U.S. News & World Report, 2019

Best Engineering Graduate Schools

- **Top 10 Ranked** Graduate Engineering Program

Best Online Graduate Engineering Programs

- **Ranked #1** Online Computer Information Technology Program (Computer Science)
- **Ranked #2** Online Graduate Engineering Programs

Best Online Graduate Engineering Programs for Veterans

- **Ranked #1** Online Graduate Computer Information Technology Program (Computer Science) for Veterans
- **Ranked #2** Online Graduate Engineering Programs for Veterans

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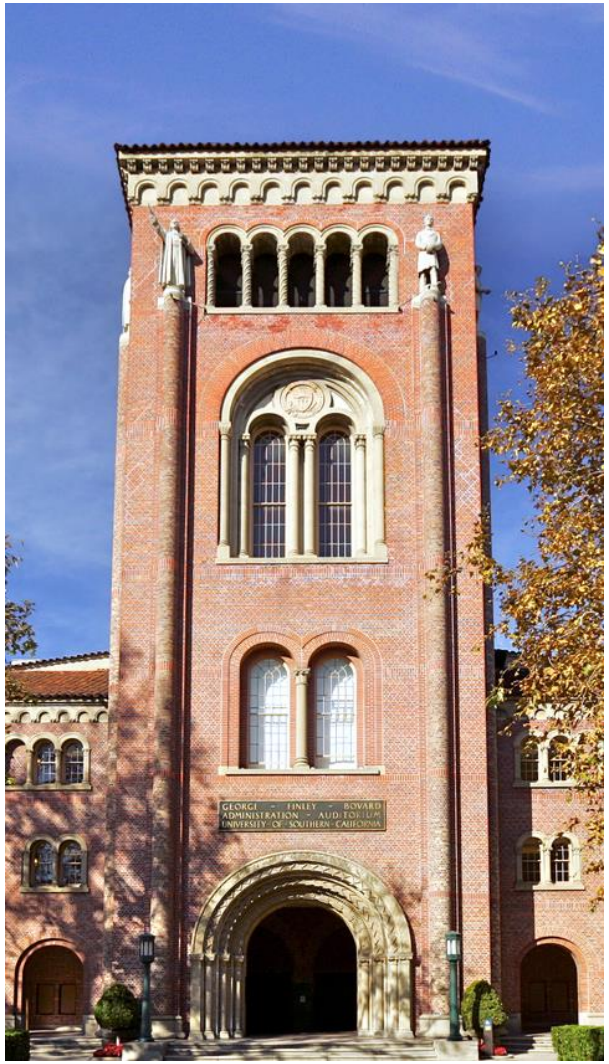
USC Engineering: Points of Distinction



- International Reputation for Excellence
- The Trojan Family Network: 77,000+ (engineers) strong
- Unique engineering programs available: *Online, on site & on campus*
- Complete range of programs
  - Doctoral, Masters and Bachelors
  - Graduate Certificates
  - Short Courses
  - Custom Programs

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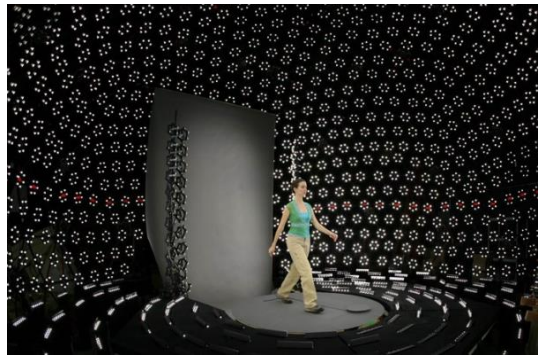
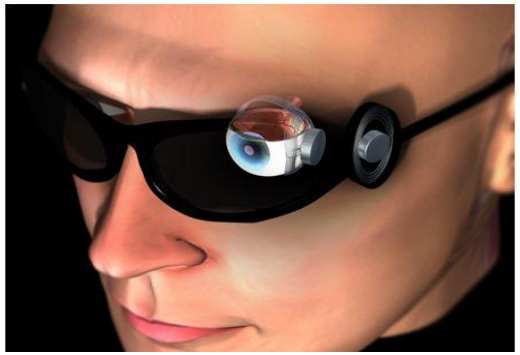
The Viterbi School of Engineering: A Leader in Research

Viterbi School is a consistent leader in funded research in the U.S.



Institute for Creative Technologies



Biomimetic Microelectronic Systems Engineering Research Center

National Center for Metropolitan Transportation Research

CREATE Homeland Security Center

- Highly interdisciplinary research environment
- Diverse research areas such as robotics, software engineering, sensor networks, vision sciences, automated construction and photonics
- Over 35 research centers
- Industrial partnerships and collaboration

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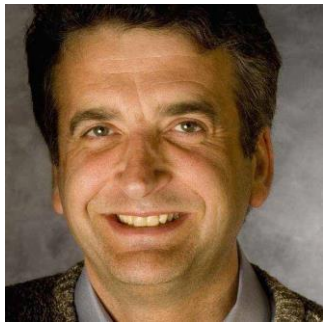
Meet Professor Richard Leahy & Professor Tony Levi

Professor Richard Leahy

- Department Chair, Ming Hsieh Department of Electrical and Computer Engineering - Systems
- PhD in Electrical Engineering, University of Newcastle-Upon-Tyne
- Dean's Professor of Electrical Engineering and Professor of Electrical Engineering, Biomedical Engineering, and Radiology

Professor Tony Levi



- Department Chair, Ming Hsieh Department of Electrical and Computer Engineering – Electrophysics
- PhD in Physics, University of Cambridge
- Professor of Electrical Engineering - Electrophysics and Physics and Astronomy

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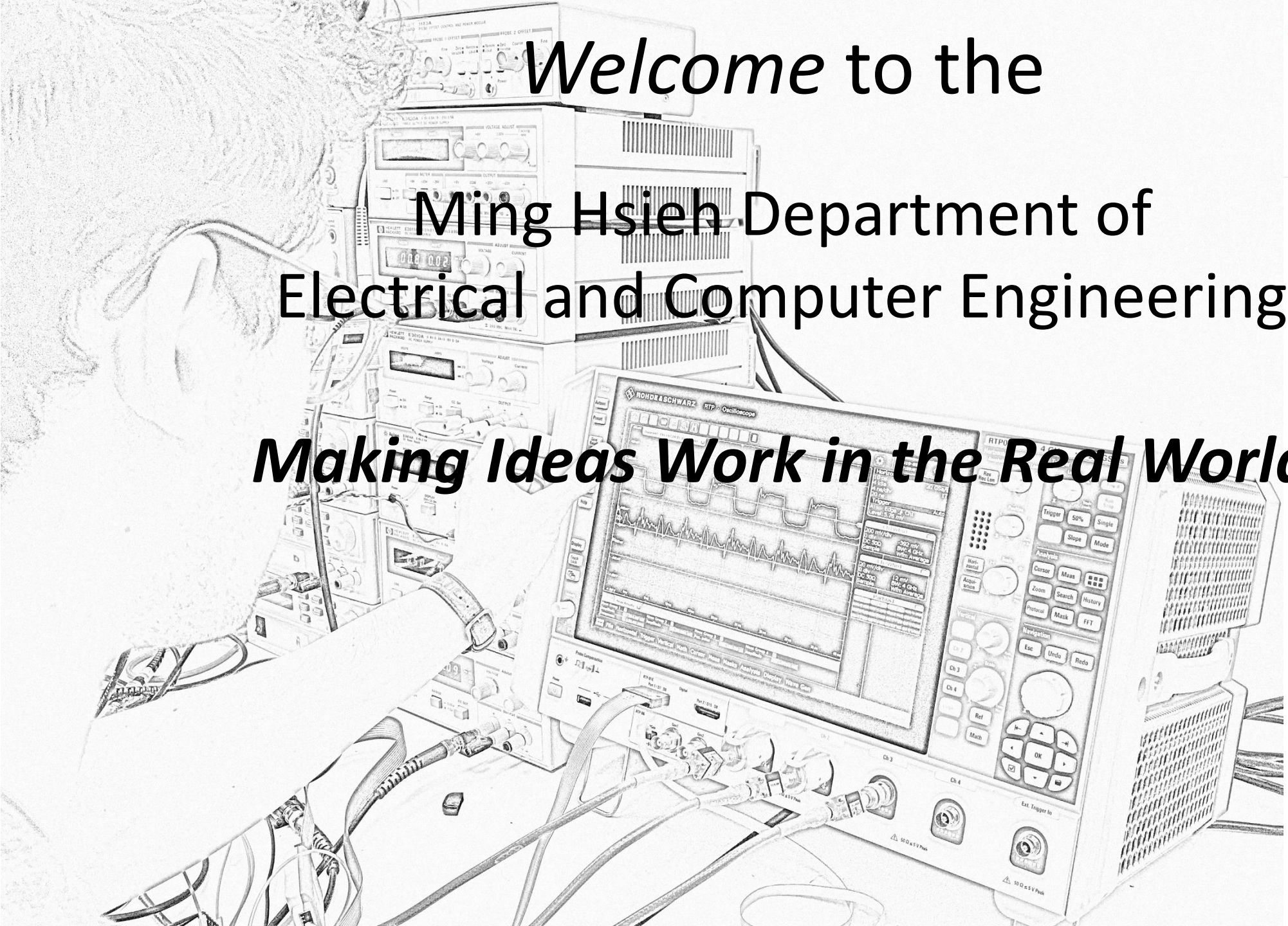


Welcome to the

Ming Hsieh Department of Electrical and Computer Engineering

Making Ideas Work in the Real World

USC Viterbi School of Engineering

Viterbi School of Engineering and the Technology Ecosystem in Southern California

USC Viterbi School of Engineering

- Located in California's Southland (10M people of LA county plus 3.5M people of Orange county) with combined GDP of $1.1T (2019), c.f. Mexico 132M people GDP $1.2T (2019)
- Viterbi School of Engineering Ranked 9th in USA by *U.S. News and World Report* (2019)
- ECE: Electrical and Computer Engineering
- CS: Computer Science
- ISI: Information Science Institute
- Related University centers
  - ICT: Institute for Creative Technology
  - HPCC: High Performance Computing Center

Keck School of Medicine

ISI

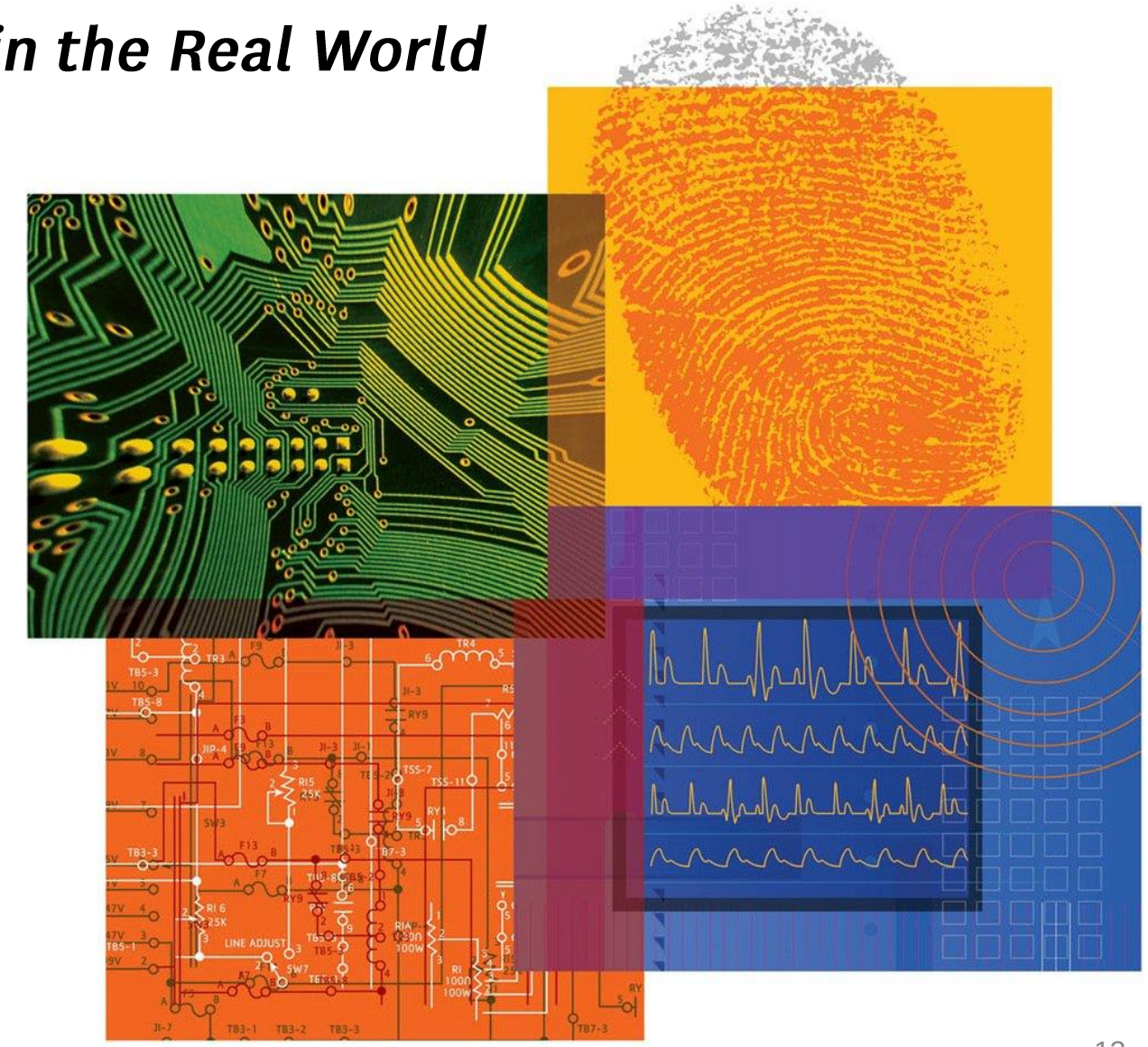
ICT

USC park campus

Ming Hsieh Department of Electrical and Computer Engineering

Making Ideas Work in the Real World

- Founded in 1905
- 300 undergraduate students, 1400+ M.S. students, 300 Ph.D. students
- Research volume (2017) $35M+
- Ranked 13th in USA by *U.S. News and World Report*
- 67 T/TT full-time faculty
- Notable alumni
  - Andrew Viterbi, Ph.D. in 1963, Co-founder of Qualcomm
  - Ming Hsieh, B.S. in 1983, M.S. in 1984, Founder & CEO of Cogent Systems Inc.
  - William Wang, B.S. in 1986, Founder & CEO of Vizio
  - Mike Markkula, B.S. and M.S., Angel Investor & second CEO of Apple
  - Kevin Jou, Ph.D., CTO of MediaTek
  - Xiaofan Simon Cao, M.S. & Ph.D., CEO of Materion Precision Optics (Shanghai)



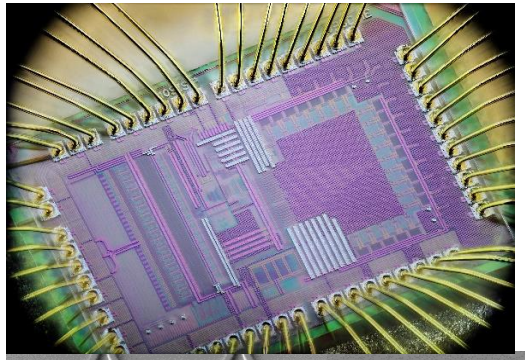
Ming Hsieh Department of Electrical and Computer Engineering

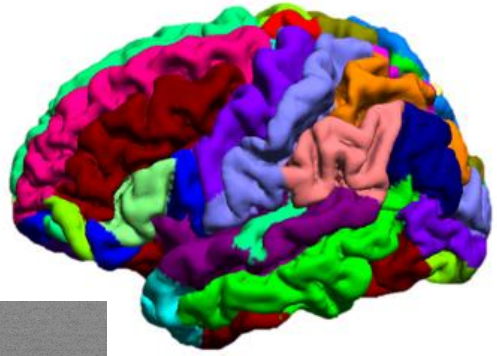
The Ming Hsieh story

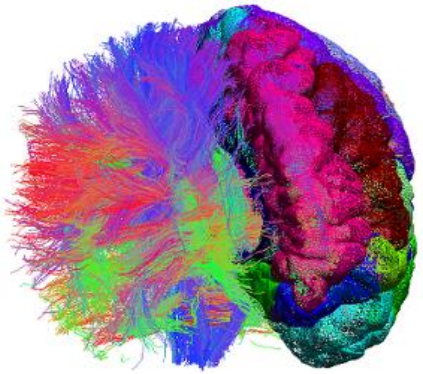
USC alumnus Ming Hsieh, BSEE ’83, MSEE ’84, was co-founder, president, CEO and chairman of the board of Cogent, Inc., one of the top providers of fingerprint identification systems in the United States. Cognet was sold to 3M in 2010. Currently he is CEO of Fulgent, a contract laboratory for genetic testing. His generous gift of $35 million to USC in 2006 was the largest ever to name an engineering department in the United States. He was elected to the National Academy of Engineering in 2015.

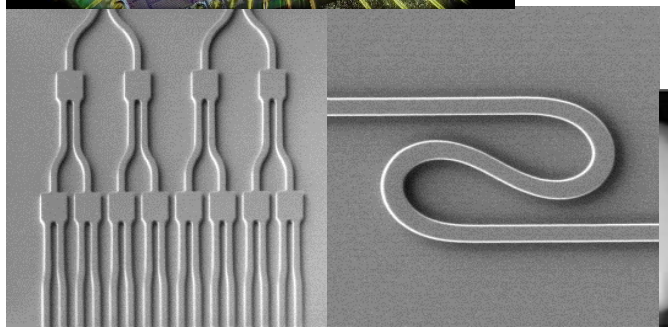
Ming Hsieh Department of Electrical and Computer Engineering

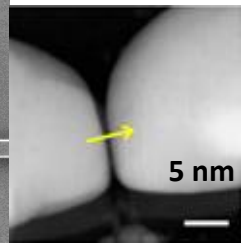
Research for Real World Applications

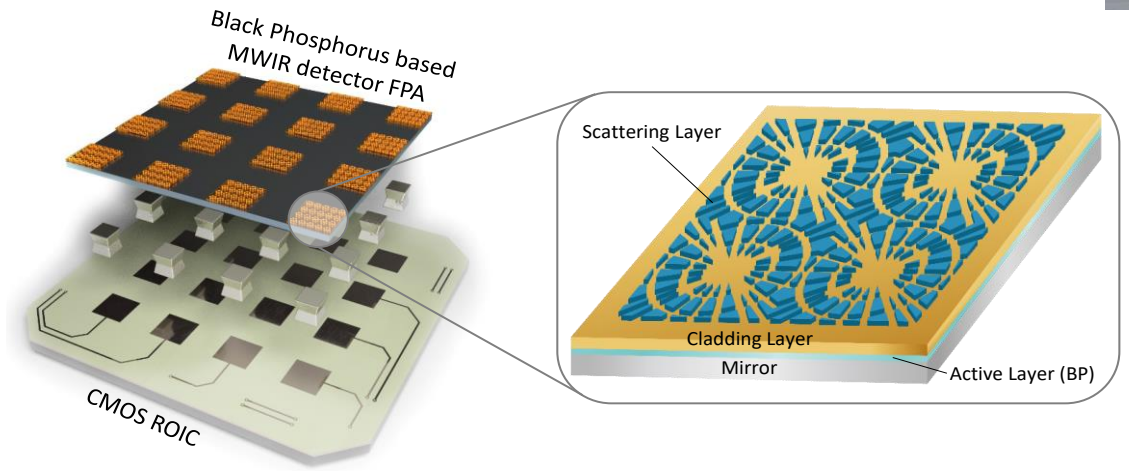


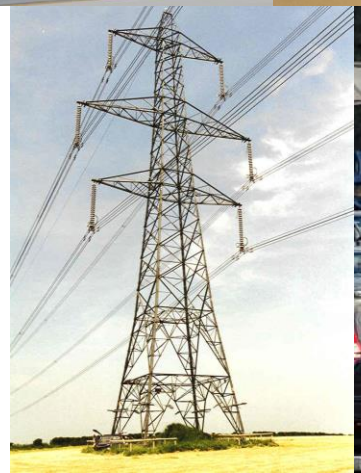












Ming Hsieh Department of Electrical and Computer Engineering

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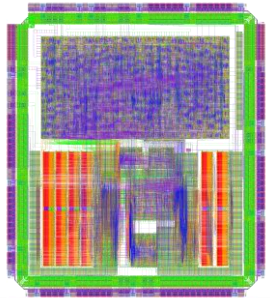
Examples of *startup companies*

Reduced Energy Microsystems (REM)



Low-Power Encryption Chip
Built by REM/USC//Galois

- Licensed P. Beerel's research on async VLSI design
- Co-founder - USC student Dylan Hand (2015)
- Y-Combinator participant. Raised 2M$+ in investment
- Team acquired by Galois, Inc (2018)

Trellisware Technologies Inc.

TrellisWare TECHNOLOGIES

Software defined radio and forward error correction methods for military and commercial communications

- Co-founded by K. Chugg in 2000
- >200 employees

Pulse Biosciences

Immuno-oncology and dermatologic applications of ns pulsed power

- Nasdaq listed PLSE since 2016
- Transitioned via Alfred Mann Institute (J. Lasch) from M. Gundersen lab

ABtum

In front. In tune.

ABtum was a fabless supplier of next generation RF front-end filters for 4G/4.5G LTE including the LTE Carrier Aggregation (LTE-CA) market.

- Founded out of H. Hashemi's lab with post-doc Dr. Behnam Analui
- Competed in MEPC and won (2010)
- Incubated at EvoNexus (Irvine) and acquired in 2018

Transient Plasma Systems

Sells pulsed-power systems for research and commercial applications

- Founded out of M. Gunderson lab with former students
- 2019 · TPS closed $8.5M Kairos Series A
- 2018 · TPS closed $1.5M Kairos Seed
- 2017 · $1M grant from the California Energy Commission
- Shipping products now! See http://transientplasmasystems.com

Electrical and Computer Engineering: Program Offerings

Available online via DEN@Viterbi

- MS in Electrical Engineering
- MS in Computer Engineering
- MS in Electrical Engineering (Computer Networks)
- MS in Electrical Engineering (Electric Power)
- MS in Electrical Engineering (Multimedia & Creative Technologies)
- MS in Electrical Engineering (VLSI Design)
- MS in Electrical Engineering (Wireless Health Technology)
- MS in Electrical Engineering (Wireless Networks)
- MS in Financial Engineering
- MS in Electrical Engineering/Engineering Management (dual degree)

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MS in Electrical Engineering – Program Details

Program Requirements: Minimum of 28 units

Available online via DEN@Viterbi

5 Courses should be taken from one or more of the following areas (15-20 units total)

- Computer Networks and Computer Systems Performance Area
- Computer Systems Architecture Area
- Communications Area
- Controls Area
- Design and Implementation of Digital Circuits (VLSI) Area
- Electric Power Systems Area
- Mixed-Signal Integrated Circuits Area
- Optics / Photonics Area
- Signal and Image Processing Area
- Telecommunication Systems Area

Additional Requirements

- Minimum 20 units must be taken in electrical engineering
- Minimum 19 units must be taken at the 500-or 600-level (adviser-approved courses)
- Every non-Electrical Engineering course for graduate credit requires prior written adviser approval

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MS in Computer Engineering – Program Details

Program Requirements: Minimum of 28 units

Available online via DEN@Viterbi

A minimum of 20 units of Computer Engineering courses from the listed areas below, including at least one course from two of the three following areas:

Computer Architecture - *Sample courses include:*

- EE 457 | Computer Systems Organization (4 units)
- EE 542 | Internet and Cloud Computing (3 Units)
- EE 557 | Computer Systems Architecture (4 units)

Computer Networks - *Sample courses include:*

- EE 450 | Introduction to Computer Networks (3 units)
- EE 550 | Design and Analysis of Computer Communication Networks (3 units)
- EE 555 | Broadband Network Architectures (or EE 550) (3 units)

VLSI/CAD - *Sample courses include:*

- EE 536a | Mixed-Signal Integrated Circuit Design (4 units)
- EE 552 | Asynchronous VLSI Design (3 units)
- EE 577a | VLSI System Design (3 units)

USC Viterbi School of Engineering

MS in Electrical Engineering (Computer Networks) – Program Details

Program Requirements: Minimum of 27 units

Available online via DEN@Viterbi

Fundamental Courses (11-12 units)

Three of the following courses are required

- CSCI 402 | Operating Systems (4 units)
- EE 450 | Introduction to Computer Networks (3 units)
- EE 457 | Computer Systems Organization (4 units)
- EE 503 | Probability for Electrical and Computer Engineers (4 units)

Required Courses (9 units)

Three of the following courses are required.

- CSCI 551 | Computer Communications (4 units)
- EE 550 | Design & Analysis of Computer Communication Networks (3 units)
- EE 555 | Broadband Network Architectures (3 units)
- EE 597 | Wireless Networks (3 units)

Elective Courses (6-7 units)

Students are encouraged to take two technical elective courses outside their area of specialization but within Electrical Engineering.

USC Viterbi School of Engineering

MS in Electrical Engineering (Electric Power) – Program Details

Program Requirements: Minimum of 27 units

Available online via DEN@Viterbi

Required Courses (15 units)

- EE 443 | Introduction to Power Systems (4 units)
- EE 444 | Power Systems Technology (4 units)
- EE 521 | Power System Analysis and Design (4 units)
- SAE 515 | Sustainable Infrastructure Systems (3 units)

Elective Courses (minimum 12 units)

At least four courses required with at least one from each of the following areas:

- Transmission, Distribution, and Planning Area
- High-Voltage Equipment and Design
- Power-System Control and the Smart Grid

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School of Engineering

MS in Electrical Engineering (Multimedia & Creative Technologies) – Program Details

Program Requirements: Minimum of 27 units

Available online via DEN@Viterbi

Fundamental Courses (9 units)

All courses are required – 9 units total.

- EE 483 | Introduction to Digital Signal Processing (3 units)
- EE 519 | Speech Recognition and Processing for Multimedia (3 units)
- EE 569 | Introduction to Digital Image Processing (3 units)

Elective Courses (18 units)

No more than 4 units of electives can be taken outside of the Viterbi School of Engineering with advisor approval.

Sample approved elective courses include:

- EE 555 | Broadband Network Architectures (3 units)
- EE 577a | VLSI System Design (3 units)
- EE 669 | Multimedia Data Compression (3 units)
- CSCI 551 | Computer Communications (4 units)
- CSCI 576 | Multimedia Systems Design (4 units)

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MS in Electrical Engineering (VLSI Design) – Program Details

Program Requirements: Minimum of 27 units

Available online via DEN@Viterbi

Fundamental Courses (12 units)

All courses are required

- EE 536a | Mixed-Signal Integrated Circuit Design (4 units)
- EE 577a | VLSI System Design (3 units)
- EE 536b | Mixed-Signal Integrated Circuit Design (or EE 577b) (3 units)
- EE 577b | VLSI System Design (or EE 536b) (4 units)
- EE 552 | Asynchronous VLSI Design (3 units)

Required Courses (9-11 units)

Two courses from one designated program area and one course from another area required – Select courses available in areas including:

- VLSI/CAD
- Circuits and Devices
- Computer Systems

Elective Courses (6-8 units)

The remaining courses must be technical electives approved by a department advisor

USC Viterbi School of Engineering

MS in Electrical Engineering (Wireless Health Technology) – Program Details

Program Requirements: 29-32 units

Required Courses (20 units)

All of the following courses are required

- EE 450 | Introduction to Computer Networks (3 units)
- EE 579 | Wireless and Mobile Networks Design and Laboratory (3 units)
- MEDS 530a | Foundation of Medicine: Anatomy, Physiology, and Pathology (4 units)
- MEDS 530b | Foundation of Medicine: Anatomy, Physiology, and Pathology (4 units)
- MEDS 530c | Foundation of Medicine: Anatomy, Physiology, and Pathology (4 units)
- MEDS 597a | Health Technology Internship (1 Unit)
- MEDS 597b | Health Technology Internship (1 Unit)

Elective Courses (9-12 units)

Students are required to take three approved elective courses.

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MS in Electrical Engineering (Wireless Networks) – Program Details

Program Requirements: Minimum of 27 units

Required Courses (15 units)

All of the following courses are required

- CSCI 402 | Operating Systems (4 Units)
- EE 503 | Probability for Electrical and Computer Engineers (4 Units)
- EE 511 | Simulation Methods for Stochastic Systems (1 Unit)
- EE 535 | Mobile Communications (3 Units)
- EE 597 | Wireless Networks (3 Units)

Elective Courses (12-14 units)

Select courses available in areas including:

- Transmission Techniques and Signal Processing
- Architectures, Protocols, and Applications
- Communication Hardware and Design

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MS in Financial Engineering – Program Details

Available online via DEN@Viterbi

Program Requirements: Minimum of 30 units

Required Courses (17 units)

All of the following courses are required

- GSBA 548 | Corporate Finance (3 units)
- ISE 563 | Financial Engineering (3 units)
- EE 503 | Probability for Electrical and Computer Engineers (4 units)
- EE 512 | Stochastic Processes (3 units)
- EE 518 | Mathematics and Tools for Financial Engineering (4 units)
- EE 590 | Directed Research with faculty adviser approval (1 unit)

Elective Courses (12-14 units)

Two Courses from each area – 6-7 units from each area total.

- Finance, Business and Economics Area (6-7 units)
- Optimization, Simulations, and Stochastic Systems (6-7 units)

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MS in Electrical Engineering/MS in Engineering Management Dual Degree – Program Details

Available online via DEN@Viterbi

Program Requirements: 48 units

Required Courses

All applicants must meet the admissions requirements of both the Department of Electrical Engineering and the Department of Industrial and Systems Engineering

- 24 units must satisfy the requirements of the master's degree in electrical engineering.
- 21 units must satisfy the required courses towards the master's degree in engineering management.
- 3 units of electives approved by the program director or adviser.
- All courses counted towards the dual degree must be at the 500 level, except those 400-level courses required by the master's degree in electrical engineering

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Where Our Alumni Are Working

WHAT DO OUR STUDENTS DO?

WHAT DO OUR GRADUATES DO?

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Application Criteria for Masters Programs

General Application Criteria

- Undergraduate degree (Bachelor of Science) in engineering, math, or hard science from a regionally-accredited university
- A cumulative undergraduate GPA of at least 3.0 on a 4.0 scale is recommended
- Satisfactory scores on the general portion of the Graduate Record Examination (GRE) that are less than five years old
- Resume/CV
- Supplemental Materials (Letters of Recommendation/Statement of Purpose) – optional or required (see individual program page)
- TOEFL (International Applicants)

Each program has unique application requirements – please be sure to review specific information for your program(s) of interest:
https://viterbigradadmission.usc.edu/programs/masters/msprograms/electrical-engineering/

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Application Deadlines

Application Deadlines for 2019-2020

Helpful Links:

List of DEN@Viterbi Programs
http://viterbi.usc.edu/DENDegrees

USC Graduate Application:
https://usc.liaisoncas.com

Fall 2019

- Deadline to submit all required materials: January 15, 2019*

Spring 2020

- Deadline to submit all required materials: September 15, 2019*
- Deadline for Scholarship Consideration (on-campus only): August 31, 2019

Fall 2020

- Deadline to submit all required materials: January 15, 2020
- Deadline for Scholarship Consideration (on-campus only): December 15, 2020

** A deadline extension for DEN@Viterbi applicants may be available. Please email DEN@Viterbi.usc.edu for more information.*

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Course Delivery Methods

Methods of Course Delivery

- **On-campus, full time**
  - 2-3 classes per semester
  - 1.5 – 2 years to complete

- **Online delivery via DEN@Viterbi**
  - 1-2 classes per semester
  - 2.5 – 3 years to complete degree

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How DEN@Viterbi Works

The Viterbi School of Engineering uses a state-of-the-art, proprietary web-based delivery system that enables students from around the world to access classes live or on-demand.

DEN@Viterbi Students:

- View the same lectures as on-campus students, with fresh content every semester
- Participate in highly interactive discussions with professors and peers
- Submit homework electronically
- Take exams at proctored testing centers near their home or work (or at USC if in the Los Angeles area)

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DEN@Viterbi Overview

	DEN@Viterbi Student	On-Campus Student
Program Admission	USC Graduate Application & required materials	USC Graduate Application & required materials
Weekly Course Lectures	Online with Interactivity	On USC's Campus
Online Course Archives (Lectures & Course Documents)	✓	✓ *
Assignments	Submit electronically according to course deadlines	Submit during lecture or lab according to course deadlines
Exams	Proctored location	USC's campus
Courses per Semester (Average)	1-2	3-4
Degree Completion Requirements	27-37 units with a 3.0 GPA or above	27-37 units with a 3.0 GPA or above
USC Diploma (No Distinction)	✓	✓

*DEN@Viterbi Sections Only

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DEN@Viterbi's E-Learning System

DEN@Viterbi Classroom

USC Viterbi
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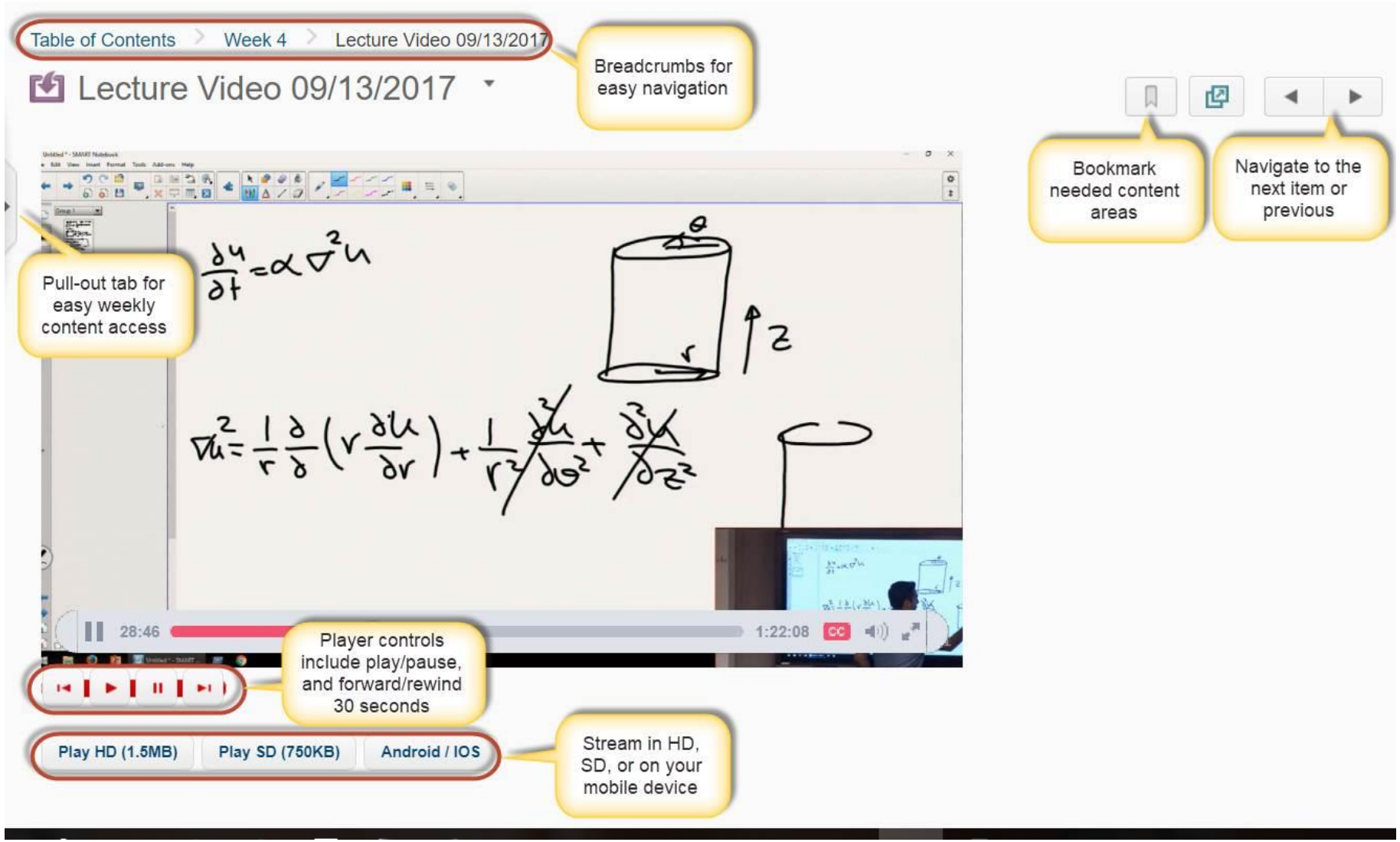
DEN@Viterbi's E-Learning System



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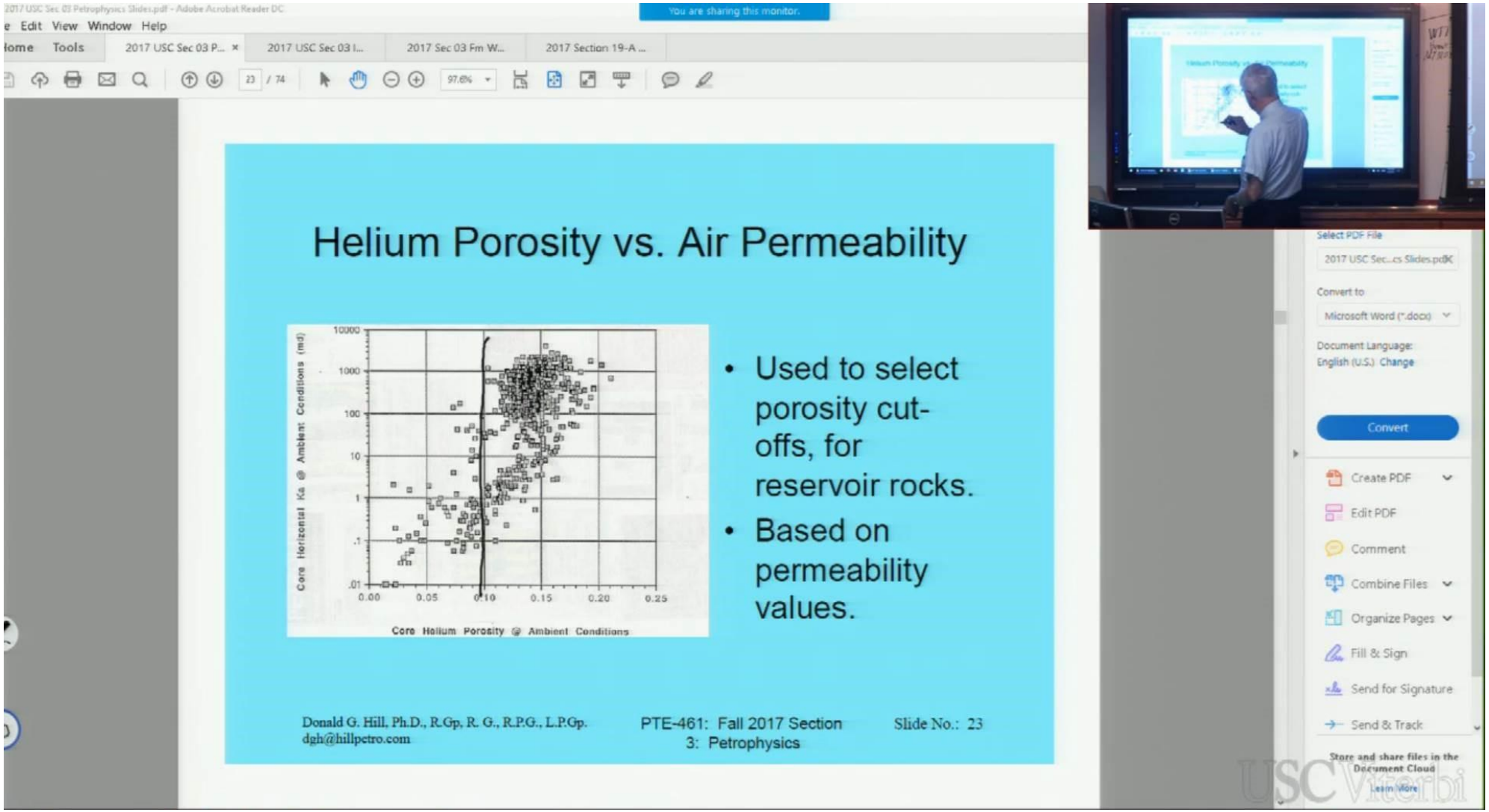
DEN@Viterbi's E-Learning System



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Student Interactivity & Group Meetings

- All DEN@Viterbi students are provided access to their own meeting rooms which can be used for several purposes:
  - Enable video communication (web and mobile)
  - Integrate phone conferencing
  - Integrate fixed room IP video systems
  - Desktop sharing
  - Set up meetings with faculty, teaching assistants and peers
- Call in during live lectures
- Participate in live chats and threaded discussion boards

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DEN@Viterbi

Question: Is there any difference between earning a Master's degree on campus vs. via DEN@Viterbi?

Answer: NO. DEN@Viterbi is a delivery method. Students adhere to the:

- Same Admission Criteria
- Same Curriculum
- Same Exams and Homework
- Same Academic Standards and Graduation Requirements

Therefore…

You earn the *same diploma* whether you earn the degree on-campus or online through DEN@Viterbi.

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DEN@Viterbi Additional Info

- **Limited Status**
  - Allows strong candidates to begin coursework before formal admission.
  - Courses (***maximum of 12 units)*** can be applied toward degree program once admitted but ***limited status does not guarantee admission.***
  - **Get Started Summer 2019:** https://viterbigradadmission.usc.edu/denviterbi/getting-started/
- **Tuition Deferment Program**
  - Students supported by company can defer “up front” payment of tuition until after the semester is over.
  - Company must pay 75-100% of tuition to be eligible for program.
  - For additional information: https://viterbigrad.usc.edu/tuition-and-funding/employer-supported

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Tuition & Fees (2018-2019)

PER-COURSE FEES	Unit Cost	Tuition for 3-Unit Course	Tuition for 4-Unit Course
Tuition for 500/600 level course	$2,005	$6,015	$8,020

Degree Programs are 27-36 units (9-11 courses)

For an overview of additional fees, please visit:
https://viterbigradadmission.usc.edu/programs/masters/tuition-funding/tuition-funding-masters/

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School of Engineering

Getting Started

For those interested in taking classes on campus:

- Visit USC campus
- Start your application:
  http://www.usc.edu/admission/graduate/apply

For those interested in taking classes online via DEN@Viterbi:

- Start as a Limited Status Student in Summer 2019 -or-
- Start your application:
  http://www.usc.edu/admission/graduate/apply

USC Viterbi
School of Engineering

Contact Us

USC Viterbi School of Engineering
Graduate & Professional Programs

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DEN@Viterbi: DEN@Viterbi.usc.edu

213.740.4488

http://viterbi.usc.edu/gradprograms

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