WELCOME & INTRODUCTIONS

Director, Engineering Executive Education: Gary Henderson
AGENDA

- 5:30p  Master of Advanced Studies Overview
- 5:45p  Wireless Embedded Systems (WES)
- 6:00p  Architecture-based Enterprise Systems Engineering (AESE)
- 6:15p  Data Science and Engineering (DSE)
- 6:30p  Next Steps
  - Breakouts for each program
MAS STAFF

Gary Henderson  
Director, Engineering Executive Education

Yvonne Wu  
Assistant Director & Program Manager, DSE and WES

Stacey Williams  
Program Manager, AESE

Kristin Liljestrom  
MAS Ops and Administration

Sage Longpre  
MAS Fiscal Operations
UC SAN DIEGO JACOBS SCHOOL OF ENGINEERING

• Jacobs School of Engineering (largest in CA among public universities)
• Ranked 10th top engineering school in the nation
• Distinguished faculty (>275 research-active faculty)
• Commitment to serving needs of industry for latest in research and education
• More rankings information can be found here: https://jacobsschool.ucsd.edu/about/rankings
200+ COMPANIES REPRESENTED
MASTER OF ADVANCED STUDIES (MAS)

• Master’s degree, conferred by the UC San Diego
• Professional degree programs designed for engineering and technical professionals
• Unique interdisciplinary degree program focused on emerging technology areas and new fields traditional curricula do not address
• MAS degree programs
  • AESE - Architecture-Based Enterprise Systems Engineering (since 2010)
  • WES - Wireless Embedded Systems (since 2011)
  • DSE - Data Science and Engineering (since 2014)
  • More in development!
PROGRAM DESIGN

• Graduate degrees that meet the needs of engineering and technical professionals
• Designed to address skills that are most needed to solve today’s most pressing challenges
• Delivers integrated interdisciplinary knowledge
• Optimized for working professionals
## GENERAL ADMISSIONS REQUIREMENTS

<table>
<thead>
<tr>
<th>Program</th>
<th>Work Experience</th>
<th>2022 Application Deadlines</th>
<th>General Requirements For All Programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>AESE</td>
<td>5 years</td>
<td>March 2nd: early consideration</td>
<td>Bachelor’s degree in engineering, science, mathematics, physics, etc.</td>
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<tr>
<td>WES</td>
<td>2 years</td>
<td>May 4th: standard</td>
<td>No GRE</td>
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<tr>
<td>DSE</td>
<td>2 years</td>
<td></td>
<td>3.0 minimum GPA*</td>
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</table>

No TOEFL if working in US for more than 1 year*

$120 ($140 international) application fee*

*Some exceptions. Veterans may request fee waiver
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<thead>
<tr>
<th>Schedule</th>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
<th>Summer</th>
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<td>capstone</td>
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<td>WES 2 Years</td>
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<tr>
<td>DSE 2 Years</td>
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<td>8</td>
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<td>8</td>
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# FALL 2022 COHORTS PROGRAM COST

<table>
<thead>
<tr>
<th>Program</th>
<th>Units</th>
<th>Total Cost*</th>
<th>Includes</th>
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<tr>
<td>AESE</td>
<td>42 (1 yr)</td>
<td>$34,042.21</td>
<td>Tuition</td>
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<td>Course Materials</td>
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<td>Software and Hardware</td>
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<td>Parking and Meals</td>
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<tr>
<td>WES</td>
<td>36 (2 yr)</td>
<td>$38,725.72</td>
<td>Mandatory UC graduate student fees**</td>
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<tr>
<td>DSE</td>
<td>38 (2 yr)</td>
<td>$41,203.02</td>
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</tbody>
</table>

* Does NOT include mandatory health coverage (~$3500. per academic year) – can be waived with proof of insurance

** UC Graduate Student Fees are estimated pending State of California final budget. Final per-unit tuition amounts are subject to change pending central campus approval.
SPECIFIC PROGRAM INFORMATION

Data Science & Engineering

Details available for each program

https://jacobsschool.ucsd.edu/mas
In the interest of time, questions will be answered in the breakout rooms after the presentation.
WIRELESS EMBEDDED SYSTEMS

Faculty Directors: Dr. Ryan Kastner and Dr. Fred Harris
Learn the fundamentals of wireless communications and embedded system design and build advanced wireless embedded systems using modern design tools.

OVERVIEW

Faculty Directors
Dr. Ryan Kastner – Professor of Computer Science and Engineering
Dr. Fred Harris – Professor of Electrical and Computer Engineering

Intended Audience
Engineering professionals with a background in computer science and/or electrical engineering

Courses
2-year program (Sep 2022 – June 2024) with classes on alternating Saturdays or Fri/Sat
7 quarters, including summer 2023
Global Number of Connected IoT Devices

Number of global active IoT Connections (installed base) in Bn

- Wireless Neighborhood Area Networks (WNAN)
- 5G
- Other
- Cellular / M2M
- Wired
- LPWA
- Wireless Local Area Networks (WLAN)
- Wireless Personal Area Networks (WPAN)

Note: IoT Connections do not include any computers, laptops, fixed phones, cellphones or tablets. Counted are active nodes/devices or gateways that concentrate the end-sensors, not every sensor/actuator. Simple one-directional communications technology not considered (e.g., RFID, NFC). Wired includes Ethernet and Fieldbuses (e.g., connected industrial PLCs or I/O modules); Cellular Includes 2G, 3G, 4G; LPWAN includes unlicensed and licensed low-power networks; WPAN includes Bluetooth, Zigbee, Z-Wave or similar; WLAN includes Wi-Fi and related protocols; WNAN includes non-short range mesh; Other includes satellite and unclassified proprietary networks with any range.

Source: IoT Analytics Research 2018
• Enable innovations across wide range of application domains
• Wireless and low power
• Complex system design tradeoffs: Performance, cost, form factor, and power consumption
• Heterogenous: mix of SW and HW
• Requires an interdisciplinary background in systems, software, hardware, and communication theory
# WES CURRICULUM

<table>
<thead>
<tr>
<th>Fall Year One</th>
<th>Winter Year One</th>
<th>Spring Year One</th>
<th>Summer Year One</th>
</tr>
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<tbody>
<tr>
<td>Digital Signal Processing</td>
<td>Intro to Embedded Systems</td>
<td>Digital Signal Processing II</td>
<td>Software for Embedded Systems</td>
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</tr>
<tr>
<td>Fall Year Two</td>
<td>Winter Year Two</td>
<td>Spring Year Two</td>
<td></td>
</tr>
<tr>
<td>Digital Communication Systems I</td>
<td>Digital Communication Systems II</td>
<td>Capstone Project</td>
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</tr>
<tr>
<td>Hardware for Embedded Systems</td>
<td>Wireless Embedded Systems on a Chip</td>
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</table>
ADMISSIONS REQUIREMENTS

• Bachelor’s Degree in engineering, science, physics, mathematics, etc.
• 3.0 minimum GPA
• Statement of Purpose
• 3 Letters of Recommendation
• Resume
• No GRE if at least two years’ relevant experience
In the interest of time, questions will be answered in the breakout rooms after the presentation.
ARCHITECTURE-BASED ENTERPRISE SYSTEMS ENGINEERING LEADERSHIP PROGRAM

Faculty Directors: Dr. Hal Sorenson and Dr. Jon Wade
Develop “systems thinking” capabilities which incorporates enterprise landscape, enterprise stakeholders, and enterprise goals/missions

OVERVIEW

Faculty Directors
Dr. Hal Sorenson – Professor Emeritus of Mechanical and Aerospace Engineering
Dr. Jon Wade – Professor of Practice in Mechanical and Aerospace Engineering

Intended Audience
Engineers with five+ years of relevant professional experience who are in a position to drive enterprise systems

Courses
1-year program (Sep 2022 – August 2023)
Alternating Fridays/Saturdays + 1 four-day workshop per quarter
Architecture-Based Enterprise Systems Engineering
Thinking & Leadership Program

N2 chart example

UC San Diego
JACOBS SCHOOL OF ENGINEERING
“Information Age” Components
- Server farms
- The internet
- Digital capabilities
- Mobile devices
- Internet of Things (IoT)
- The Cloud
- Big data
- AI / machine learning...

We focus on the integration of previously unconnected systems and their interoperability to accomplish previously unavailable tasks.
AESE CURRICULUM

**USING**
- Systems Technology

**FALL**
- Systems Thinking
  - Leadership
  - Goals & Strategy
  - Finance / Accounting
  - Complex Systems
  - Agile Development
  - DevOps

**SPRING**
- Decision Systems
  - MOPs and MOEs
  - Event-driven Architectures
  - Art of Decision Making
  - Data Analytics
  - Big Data and Deep Learning
  - Investment Valuation and NOV
  - Managing Stakeholder Relationships

**WINTER**
- Systems Development
  - Enterprise Architectures
  - Architecture Frameworks
  - Use Cases/Capabilities
  - Domain Modeling
  - Service-Oriented Architecture
  - SOA Governance
  - Enterprise Cybersecurity
  - Functional & Physical Architectures

Team Project: Fall - Summer
Enterprise systems and system-of-systems are necessarily complex adaptive systems. Development of complex adaptive systems stresses heuristics through synthesis rather than analysis. Team projects are a major requirement for program completion.
DEVELOPING SYSTEMS THINKING CAPABILITIES?

• Understand Enterprise Landscape
• Involve Enterprise Stakeholders
• Define a Goal and Mission, including a strategy and operational concept
• Identify Desired Capabilities
  • Consider Different Alternatives To Achieve The Capabilities
  • Create Business Process Models/Use Cases
• Develop Architectural Models
  • Verify Logic, Behavior, and Performance of Models
  • Emphasize Events and Decision-making
• Iterate The Earlier Considerations Based On Experimentation and Experience
• Become Leaders and Team Builders

This is what we do in AESE!
DELIVERY

• One-year program (September 2022 – August 2023)
  • Classes scheduled on alternating Fridays/Saturdays
  • One Wednesday – Saturday workshop per quarter
  • Class from 8:00a PT to 5:00p PT
  • Breakfast and lunch provided
• Classes offered sequentially
  • Three courses per quarter
  • One two-day Team Project meeting per quarter
• Each class has 32 contact hours (8 hours x 4 days)
• Final four-day Team Project / Capstone class at the end of August
ADMISSIONS REQUIREMENTS

• Bachelor’s Degree in engineering, science, physics, mathematics, etc.
• 3.0 minimum undergraduate GPA
• Statement of Purpose
• 2 Letters of Recommendation
• Typically, 5 years of relevant work experience or equivalent
• Informative Resume
• No GRE if at least two years’ relevant experience

Stacey Williams
sdw008@eng.ucsd.edu
In the interest of time, questions will be answered in the breakout rooms after the presentation.
DATA SCIENCE AND ENGINEERING

Faculty Directors: Dr. Ilkay Altintas and Dr. Alin Deutsch
Combine the skills of software programmer, database manager and statistician to create mathematical of the data, identify trends, then present them in effective visual ways.

OVERVIEW

Faculty Directors
Dr. Ilkay Altintas – Chief Data Science Officer, San Diego Supercomputer Center
Dr. Alin Deutsch – Professor of Computer Science and Engineering

Intended Audience
Engineering professionals with a background in computer science or other engineering or mathematics with substantial experience in data analysis.

Courses
2-year program (Sep 2022 – June 2024) with classes on alternating Fridays and Saturdays
WHAT IS BIG DATA?

10^9 Gigabyte

The first Gigabyte hard drive was introduced by IBM in 1980 and weighed 550 lbs with a price of $40,000

10^12 Terabyte

500TB of new data per day are ingested in Facebook databases

10^15 Petabyte

The CERN Large Hadron Collider generates 1PB per second

10^18 Exabyte

1EB of data is created on the internet each day

10^21 Zettabyte

500TB of new data per day are ingested in Facebook databases

10^24 Yottabyte

1EB of data is created on the internet each day

10^27 Brontobyte

1EB of data is created on the internet each day

10^30 Geopbyte

1EB of data is created on the internet each day
THE EDUCATION OF A DATA SCIENTIST

Hacking Skills

Machine Learning

Math & Statistics Knowledge

Data Science

Danger Zone!

Traditional Research

Substantive Expertise

Doing Data Science: Straight Talk from the Frontline
Rachel Schutt & Cathy O’Neil
# DSE COURSEWORK

<table>
<thead>
<tr>
<th>Fall Year One</th>
<th>Winter Year One</th>
<th>Spring Year One</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSE 200: Python for Data Analysis (4 units)</td>
<td>DSE 201: Data Management Systems (4 units)</td>
<td>DSE 220: Machine Learning (4 units)</td>
</tr>
<tr>
<td>DSE 290: Case studies in Data Science (2 units)</td>
<td>DSE 210: Probability and Statistics using Python (4 units)</td>
<td>DSE 230: Data Science using Hadoop and Spark (4 Units)</td>
</tr>
</tbody>
</table>

## CASE STUDIES

<table>
<thead>
<tr>
<th>Fall Year Two</th>
<th>Winter Year Two</th>
<th>Spring Year Two</th>
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</thead>
<tbody>
<tr>
<td>DSE 203: Data Integration &amp; ETL (4 units)</td>
<td>DSE 241: Data Visualization (4 units)</td>
<td>DSE 260B: Data Science Design Capstone Project (2 units)</td>
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<tr>
<td>DSE 250: Beyond Relational Data Models (4 units)</td>
<td>DSE 260A: Data Science Design Capstone Project (2 units)</td>
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</tbody>
</table>
ADMISSIONS REQUIREMENTS

• Bachelor’s Degree in engineering, science, physics, mathematics, etc.
• 3.0 minimum GPA
• Statement of Purpose
• 2 Letters of Recommendation (3 preferred)
• Resume
• No GRE if at least two years’ relevant experience

Yvonne Wu
yvwu@eng.ucsd.edu
ADDITIONAL REQUIREMENTS

MAJOR Importance (at least 2/3)
1. Programming experience in a general-purpose language (C, Java, Python)
2. Experience with databases/SQL
3. Experience with data analysis in an application domain

MINOR Importance (strengthens your application)
1. Math: linear algebra, probability and statistics
2. Distributed Systems: Hadoop, Spark...
In the interest of time, questions will be answered in the breakout rooms after the presentation.
NEXT STEPS FOR ALL PROGRAMS

For more information
JacobsSchool.ucsd.edu/MAS

Applications
Open now! Each program has a detailed Admissions page

Questions
Ask today in the breakout rooms!

More questions?
Contact Yvonne Wu or Stacey Williams

Yvonne Wu
Program Manager,
DSE and WES
ywwu@eng.ucsd.edu

Stacey Williams
Program Manager,
AESE
sdw008@eng.ucsd.edu
Please join Faculty Directors, Program Managers, and Alumni in the breakout rooms for further discussion.
THANK YOU!

JACOBSSCHOOL.UCSD.EDU/MAS