VIRTUAL OPEN HOUSE

Master’s Program Admissions

TUESDAY, FEBRUARY 2, 2021
Agenda

Welcome: Prof. David Cocker, Chair
Graduate Admissions: Prof. Ian Wheeldon
Program Overviews
• **Biotechnology**: Prof. Ian Wheeldon
• **MSOL Water Quality**: Prof. Jinyong Liu
• **Air Quality Masters**: Prof. Don Collins
Moderated Q&A: Faculty Panel
Close
Welcome!

Prof. David Cocker, Chair
# UCR and College of Engineering

America’s fastest rising university – U.S. News

## Best in Education & Opportunity

<table>
<thead>
<tr>
<th>Rank</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 1</td>
<td>Top performer in social mobility in the nation; U.S. News, 2021</td>
</tr>
<tr>
<td>Top 1%</td>
<td>Of universities worldwide; Center for World University Rankings, 2019-20</td>
</tr>
<tr>
<td>Top 35</td>
<td>Best value public colleges in America; <em>Money Magazine</em>, 2020</td>
</tr>
</tbody>
</table>

## Best Value University

<table>
<thead>
<tr>
<th>Rank</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top 12</td>
<td>Public universities in the nation; <em>Forbes, “America’s Best Value Colleges”</em></td>
</tr>
<tr>
<td>No. 14</td>
<td>U.S. college that pay off the most in 2020; <em>CNBC Make It</em>, 2020</td>
</tr>
<tr>
<td>Top 20</td>
<td>America’s best value colleges among public universities; <em>Princeton Review</em>, 2020</td>
</tr>
</tbody>
</table>

## Highly Ranked Engineering College

<table>
<thead>
<tr>
<th>Rank</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top 50</td>
<td>Public engineering college in the nation; U.S. News, 2021</td>
</tr>
<tr>
<td>No. 20</td>
<td>Best global university for engineering; U.S. News, 2021</td>
</tr>
<tr>
<td>No. 31</td>
<td>Best school of engineering majors by salary potential in the U.S.; <em>Payscale 2020 College Salary Report</em></td>
</tr>
</tbody>
</table>
Graduate Admissions

Prof. Ian Wheeldon
<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergraduate Students</td>
<td>388</td>
</tr>
<tr>
<td>Graduate Students</td>
<td>84</td>
</tr>
<tr>
<td>Tenured/Tenure Track Faculty</td>
<td>21</td>
</tr>
<tr>
<td>Young Investigator Awards</td>
<td>6</td>
</tr>
<tr>
<td>Extramural funding per PI</td>
<td>$600K</td>
</tr>
<tr>
<td>Increase in extramural funding since 2013</td>
<td>330%</td>
</tr>
<tr>
<td>Increase in faculty since 2011</td>
<td>91%</td>
</tr>
<tr>
<td>Increase in graduate students since 2012</td>
<td>50%</td>
</tr>
</tbody>
</table>
The CEE Difference

Our Department

• Dynamic and highly productive faculty
• Multi-disciplinary research and collaborative projects
• Well-supported infrastructure, laboratory research facilities, and 4 research centers
• Outstanding colloquium series

Our Graduate Program

• Joint Chemical and Environmental Engineering graduate program
• Offering M.S. degrees in Industrial Biotechnology, air quality, and water quality systems engineering
• Five-year B.S. + M.S. accelerated degree offered for UCR undergraduate students
Living in Riverside, California
Small-town charm, BIG on opportunity

Within one hour from:

- Hollywood
- Beaches
- Mountains
- Disneyland
- Palm Springs
- Wineries
- Apple Orchards
- Hot Springs
- Mission Inn
- Shopping
- Hiking Trails

PLUS: Within driving distance to: San Diego, San Francisco, Joshua Tree National Park, and Las Vegas!
Biotechnology Master’s
Prof. Ian Wheeldon
PROFESSIONAL SCIENCE MASTER’S IN INDUSTRIAL BIOTECHNOLOGY

M.S. in as few as 9-12 months
One of only a few programs training biotech & bio-pharmaceutical skills
Four focus areas
Distinguished faculty interaction
Biotech career prep in research, development, and production

NEXT-GEN BIOTECH EDUCATION

Class and lab instruction
Industrial internships
Undergraduate mentoring
Built-in CIB research training

INNOVATIVE DUAL EDUCATIONAL APPROACH
INDUSTRIAL BIOTECHNOLOGY

<table>
<thead>
<tr>
<th>HEALTH</th>
<th>FOOD &amp; AGRICULTURE</th>
<th>BIOFUELS</th>
<th>INDUSTRIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reduces</strong> rates of infectious disease</td>
<td><strong>Generates</strong> higher crop yields with fewer inputs</td>
<td><strong>Cuts</strong> greenhouse gas emissions by 52% or more</td>
<td><strong>Lowers</strong> the temperature for cleaning clothes, potentially saving $4.1B annually</td>
</tr>
<tr>
<td><strong>Minimizes</strong> health risks and side effects through tailored treatments</td>
<td><strong>Implements food</strong> and crop oil content for cardiovascular health</td>
<td><strong>Reduces</strong> fossil fuel dependence</td>
<td><strong>Produces</strong> biodegradable plastic alternatives</td>
</tr>
</tbody>
</table>
INDUSTRIAL BIOTECHNOLOGY IS A LARGE AND GROWING SECTOR OF THE US ECONOMY

Biotechnology Revenues (>$370 Billion)

- GM Crops: $140 B
- Biologics: $110 B
- Industrial: $118 B

Industrial Biotech Revenues

- Biofuels: 9.7 B
- Food & Ag: 12 B
- Biologics feedstocks: 16 B
- Biochemicals: 66 B
INDUSTRIAL BIOTECHNOLOGY IN CALIFORNIA

The State of California employs 1.4 million people in total jobs attributable to the Life Science Industry (direct/indirect/induced).

$4.59 billion in research funding from National Institutes of Health (NIH) for FY2019.

15,341 Life Science establishments.

https://www.biocom.org/eir/
1 YEAR MS CURRICULUM IN INDUSTRIAL BIOTECHNOLOGY

**Fall Quarter**
- CHE 124: Biochemical Engineering Principles
- CHE 124L: Biochemical Engineering Lab
- CEE 236: Energy: Production, Uses, Economics, and Sustainability
- CEE 238A: Bioprocess Design Laboratory I
- CEE 286 CEE Seminar

**Winter Quarter**
- CEE 212: Bioseparations
- CEE 211: Upstream Processes in Biotechnology
- CEE 238B: Bioprocess Design Laboratory II
- CEE 286 CEE Seminar

**Spring Quarter**
- CEE 210 Cell Engineering
- CEE 248: Quantitative Analysis of Upstream
- CEE 238C: Bioprocess Design Laboratory III
- CEE 286 CEE Seminar

**Summer Quarter**
- CEE 298i Industrial Internship (6-8 weeks)

Legend:
- Process design and analysis
- Core lecture material
- Wet lab course
MSOL: Water Quality Systems Engineering

Prof. Jinyong Liu
Environmental Engineering Systems (Water)

- Explore the science and engineering principles essential to providing clean water and improving the natural environment.

- This specialization incorporates elements of water treatment and chemistry, covering topics such as water systems fundamentals, physical and chemical processes, biological treatment, and advanced technologies.
### Curriculum

<table>
<thead>
<tr>
<th>Course Prefix</th>
<th>Course Name</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 200</td>
<td>Engineering in the Global Environment</td>
<td>4</td>
</tr>
<tr>
<td>ENGR 201</td>
<td>Technology Innovation and Strategy for Engineers</td>
<td>4</td>
</tr>
<tr>
<td>ENGR 202</td>
<td>Introduction to Systems Engineering</td>
<td>4</td>
</tr>
<tr>
<td>ENGR 203</td>
<td>Principles of Engineering Management</td>
<td>4</td>
</tr>
<tr>
<td>CEE 241</td>
<td>Water Chemistry in Natural and Engineered Systems</td>
<td>4</td>
</tr>
<tr>
<td>CEE 225</td>
<td>Physical and Chemical Separation Processes</td>
<td>4</td>
</tr>
<tr>
<td>CEE 226</td>
<td>Biological Treatment Processes</td>
<td>4</td>
</tr>
<tr>
<td>CEE 243</td>
<td>Advanced Treatment Technologies</td>
<td>4</td>
</tr>
<tr>
<td>ENGR 296</td>
<td>Project Design Course A, B, C, D</td>
<td>4 – 1 credit courses</td>
</tr>
</tbody>
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*UCEC 30 YEARS Marlan and Rosemary Bourns College of Engineering*
<table>
<thead>
<tr>
<th>CEE 241</th>
<th>Water Chemistry</th>
<th>CEE 226</th>
<th>Biological Processes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Chemical principles and advanced calculation for acid-base equilibrium, metal-ligand coordination, solid precipitation-dissolution, redox chemistry, reaction kinetics</td>
<td></td>
<td>Wastewater treatment: microbial principles, BOD removal, nutrient removal, sludge treatment, energy and resource recovery</td>
</tr>
<tr>
<td>CEE 225</td>
<td>Physical and Chemical Processes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Water treatment: coagulation-flocculation-sedimentation-filtration; disinfection; water softening; membrane filtration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEE 243</td>
<td>Advanced Water Treatment Technologies</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Materials and modeling for absorption, ion-exchange, and membrane technologies; advanced oxidation and and reduction methods; treatment train systems; case studies and project design on PFAS treatment, nutrient control, catalyst development, and critical thinking on frontier research and development</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Faculty Members

**Prof. Haizhou Liu**
- Water treatment and reuse
- Advanced oxidation
- Disinfection byproduct control
- Heavy metals in water distribution systems

**Prof. Jinyong Liu**
- Groundwater remediation
- Advanced reduction
- PFAS treatment
- Catalytic reduction of perchlorate

**Prof. Yujie Men**
- Fate, transport and bioremediation of emerging organic contaminants

**Prof. Yun Shen**
- Pathogen transmission and control in built environment, water and food
Master’s in Air Quality Engineering
Prof. Don Collins
## Curriculum

### Department Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEE 136</td>
<td>Aerosol Technology</td>
</tr>
<tr>
<td>CEE 207</td>
<td>Air Quality Modeling</td>
</tr>
<tr>
<td>CEE 233</td>
<td>Advanced Air Pollution Control and Engineering</td>
</tr>
<tr>
<td>CEE 234</td>
<td>Vehicle Emissions Control Technology</td>
</tr>
<tr>
<td>ENVE 134</td>
<td>Technology of Air Pollution Control</td>
</tr>
<tr>
<td>ENVE 138</td>
<td>Combustion Engineering</td>
</tr>
</tbody>
</table>

### Courses Outside of the Department

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENSC 245</td>
<td>Chemistry and Physics of Aerosols</td>
</tr>
<tr>
<td>ME 136</td>
<td>Environmental Impacts of Energy Production and Conversion</td>
</tr>
<tr>
<td>PBPL 233</td>
<td>Environmental Economics and Policy</td>
</tr>
</tbody>
</table>
Los Angeles suffers worst smog in almost 30 years
Air quality research we do in our labs

David Cocker’s group: Uses large Teflon chambers to study pollutant formation from sources like cars and in the complex mixture of species found in the atmosphere.
Air quality research we do in the field

Don Collins’ group: Uses drones to measure ozone and other pollutants
Kelley Barsanti’s group: Collects wildfire smoke samples from aircraft
Sunni Ivey’s group: Uses lightweight samplers to study personal exposure
Air quality research we do with our computers

**Suni Ivey’s group:**
Uses regional air quality models to simulate ozone formation and concentrations

**Kelley Barsanti’s group:**
Uses laboratory data to improve simulation of atmospheric chemistry
Many, many others at UCR doing air quality research

Diagram: J.F. Davies and C. Ivey

Fundamental Interactions
- J. Zhang (Chemistry)
- Davies (Chemistry)
- H. Zhang (Chemistry)
- Bahreini (Env. Sci.)
- Cocker (Chem. Env.)
- Lin (Env. Sci.)
- Hopkins (Env. Sci.)
- Ivey (Chem. Env.)
- Li (Env. Sci.)

Molecular scale
- Molecular and photon interactions
- Chemical kinetics
- Spectroscopy

Nanoscale to microscale
- Aerosol chemistry and trace gas interactions
- Particle formation
- Aerosol composition

Local scale
- Exposure
- Health
- Cloud interactions
- Solar interaction

Urban scale
- Emissions
- Exposure
- Health

Regional scale
- Biomass Burning
- Source Apportionment
- AQ-Meteorology

Global scale
- Transport
- Climate and AQ

Increasing length scale and complexity

Diagrams: J.F. Davies and C. Ivey
An exciting addition to our (almost) campus

Southern California Headquarters

CARB is building a new Southern California Headquarters

Under construction on a 19-acre site near the campus of UC Riverside, the approximately 380,000 square-foot facility will be one of the largest and most advanced vehicle emissions testing and research facilities in the world. It will also be the largest ‘net-zero energy’ structure (producing as much energy as it uses) of its type in the nation. The facility will also be designed to achieve Leadership in Energy and Environmental Design (LEED) Platinum certification and meet CalGreen Tier 2 standards. The facility is scheduled to be completed in early 2021.

“This striking design will make CARB's new Southern California headquarters an immediately recognizable landmark,” said CARB Chair Mary D. Nichols. “It incorporates the highest standards of sustainability in the office and public spaces, and meets the exacting laboratory specifications we need to keep California at the forefront of our world-leading efforts to clean up our air and fight climate change.”
An exciting addition to our graduate program for fall 2021*

Master’s in Air Quality Engineering

- Non-thesis M.S. that can be **completed in 1 year**
- **16 units of core courses**
  - Air Quality Modeling
  - Advanced Air Pollution Control and Engineering
  - Vehicle Emissions Control Technology
  - Energy: Production, Uses, Economics, and Sustainability
- **16 units of electives** from list of 18 courses
- **4 units of internship and project**
  - ARB, AQMD, EPA, ...

Online Master’s in Environmental Engineering Systems (Air)

- Non-thesis M.S. that can be **completed in about 1 year**
- **16 units of core courses**
  - Air Quality Modeling
  - Advanced Air Pollution Control and Engineering
  - Vehicle Emissions Control Technology
  - Energy: Production, Uses, Economics, and Sustainability
- **16 units of professional engineering courses**
- **4 units of professional project design course**

* Pending final approval
Faculty Q&A Panel

Please submit your questions in the chat!

All specific admissions inquiries may be sent to gradcee@engr.ucr.edu.
CONNECT WITH US
Chemical and Environmental Engineering
Website: www.cee.ucr.edu
Email: gradcee@engr.ucr.edu
Twitter: @CEEatUCR
Apply to CEE!