## UNIVERSITY OF COLORADO
CEAE DEPARTMENT
FACULTY AND STAFF MEETING MINUTES

<table>
<thead>
<tr>
<th>Date</th>
<th>Apr. 1, 2015</th>
<th>Time</th>
<th>12P – 1P</th>
</tr>
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<tbody>
<tr>
<td>Facilitator</td>
<td>R. Balaji</td>
<td>Scribe</td>
<td>M. Hubler</td>
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<tr>
<td>Location</td>
<td>ECCE1B41</td>
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<tr>
<td>Attendees</td>
<td>Kasprzyk, Warren, Morrison, Summers, Quinlan, Beamer, Vasconez, Young, Vallejos, Lambert, Jerick, Corotis, Javernick-Will, Kuchenrither, Cook, Srubar, Linden, Silverstein, Pfeffer, Balaji</td>
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### Key Points discussed

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<tr>
<th>No.</th>
<th>Topic</th>
<th>Highlights</th>
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| 1   | Discussion of AREN minor and Curriculum Committee announcements | • If the AREN minor is approved by vote of the CEAE faculty, it then must gain approval from the College Undergraduate Education Council (UEC); there are two meetings left of UEC this semester: April 16 and early May. If approved by CEAE, we will try to get on their agenda.  
• See attached handout on the AREN minor.  
• Curriculum committee announcements:  
  - CVEN minor (curriculum committee working on this over the next month)  
  - For the CVEN degree, the potential to allow one of the technical electives (3-credits; the non-CEAE one) to be a 2000-level course (per list approved by curriculum committee); under discussion; email comments to Angie or curriculum committee rep  
  - On-going consideration of drawing/geomatics needs of CVEN students; currently required courses differ from AREN to CVEN |
| 2   | Research presentation by Sherri Cook | • See attached presentation. |
| 3   | Adjourn |
Minor in Architectural Engineering

The Program

The undergraduate minor in Architectural Engineering serves students majoring in General Science and Engineering fields (other than Architectural Engineering) at CU who are interested in Building Science, Engineering, and System Designs. The minor is intended to expose students to basic building science knowledge, engineering and system concepts, and calculation and design skills. A cumulative GPA of 2.75 or higher is required to be eligible for minor registration. Students must meet the prerequisites and take at least six courses (18 credits) in this minor to satisfy the requirements. All minor courses must be met with a C- or better.

Prerequisites

- Calculus I, II, III and Differential Equations;
- Two semesters of calculus-based Physics;
- Statics

A student may be accepted into the minor program with no more than two of these courses as deficiencies. All deficiencies must be completed before a minor degree is awarded.

Three Required Core Courses

- AREN 2050: Building Materials and Systems
- CVEN 3246: Introduction to Construction

Two Required Courses for Each Track

1. Mechanical Track:
   - AREN 3010: Building Mechanical Systems (Req: AREN 2050, Thermodynamics, Fluid Mechanics)
   - AREN 4110: HVAC Design (Req: AREN 3010)

2. Structure Track:
   - CVEN 3525: Structural Analysis (Req: CVEN 3161)
   - CVEN 4545/4555: Structure Design (Req: CVEN 3525)

3. Electrical Track:
   - ECEN 3030: Electrical Circuits (Req: Differential Equations)
   - AREN 4570: Electrical Systems (Req: ECEN 3030)

4. Lighting Track:
AREN 3540: Illumination 1 (Req: Calculus III and Engineering Computing)
AREN 4550: Illumination 2 (Req: AREN 3540)

5. Construction Engineering and Management (CEM) Track
   - AREN 4506: Project Management I - Estimating and Scheduling up to Contract Award
   - AREN 4606: Project Management II - Project Controls

*Note that: CVEN students are only allowed to take Mechanical, Lighting and Electrical Track in this minor.

One Elective (from the following approved courses)
   - ENVD 3134/3114: History and Theory of Architecture
   - AREN 1027: Engineering Drawing (or Equivalent)
   - AREN 4010: HVAC System Modeling and Controls
   - AREN 4130: Optical Design
   - AREN 4315: Timber Structure Design
   - AREN 4530: Advanced Lighting Design
   - AREN 4560: Radiative Transfer
   - CVEN 4565: Masonry Structure Design
   - AREN 4580: Daylighting
   - AREN 4830: Lighting Workshop
   - CVEN 5020: Building Energy Audits
   - CVEN 5050: Advanced Solar Design
   - CVEN 5070: Thermal Analysis of Buildings
   - AREN 4830: Computer Simulation of Building Systems
   - CVEN 5830: CFD Analysis of Buildings and Environment
   - CVEN 5830: Distributed Electrical Generation
   - CVEN 5830: Color Theory/Light Source
   - CVEN 5830: Data Analysis and Modeling
   - CVEN 5830: Sustainable Building Design
   - AREN 5830: Forensic Engineering

*Note that: (1) not all these courses are offered every year; (2) most of these courses have prerequisite requirements.

Or
   - A course from the other tracks than your own track
Sustainable Water Systems: Coupling experimentation, modeling, & sustainable design to promote sustainable and resilient water systems

Sherri M. Cook
Assistant Professor
Civil, Environmental, & Architectural Engineering Department
Environmental Engineering Program

April 1, 2015

Sustainable solutions are needed to overcome increasing challenges faced by water & wastewater management systems.

[The image complements of Linda MacPherson, CH2M HILL]
Our research group promotes the development, design, & implementation of sustainable water treatment systems.

- Strategically recovering resources from waste
- Designing resilient environmental biotechnology systems
- Safely & efficiently closing the water treatment cycle

![Image from http://engineeringforsustainability.com/research](http://engineeringforsustainability.com/research)

Our decision framework provides focuses for our research efforts and supports collaborations in other domains.

**Sustainability Decision Framework**

- Goal and scope definition
- Inventory analysis
- Treatment technology functional assessment
- Impact assessment (Environmental, Economic, Social)
- Implementation Scenarios
- Interpretation
Organic waste management systems pose sustainability challenges while they serve as a source of resources.

- Sludge treatment is cost and energy intensive
- Food waste contributes to global warming
- FOG contributes to sewer overflows

Organic waste management systems pose sustainability challenges while they serve as a source of resources.
Reliable resource recovery using codigestion:
Modeling and experimental evaluations of the stability and resource recovery potential of anaerobic codigestion

Model-driven hypothesis generation & experimental design

Optimizing resource recovery from solid waste:
Life cycle and spatial comparison of emerging and traditional approaches

Collaborator: Andrew Henderson (UT Health Science Center, SPH)


Life cycle assessment (LCA) is a standardized methodology to evaluate the environmental consequences of a product or activity.
Preliminary Scope and Data: A comparison of the life cycle environmental impacts of disinfection technologies

Greywater Treatment: Low Pollutant Load with Biofiltration and Biochar Adsorption

- Biochar absorption capacity compared to GAC
- Biofiltration performance: media material, toxic shocks
- Impact of pre-chlorination on biological treatment and settling (odor)
- Comparing sustainability of biochar and GAC

PhD Student: Kyle Thompson; Advisors: Scott Summers & Sherri Cook
Committee: JoAnn Silverstein, Paul Landers, and Sybil Sharvelle
Energy-neutral water reuse treatment potential: Modeling and comparing nonpotable reuse treatment options to maximize resource recovery from wastewater

Comparative Energy Requirement

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Energy Requirement (kWh/m³ of treated WW)</th>
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<tbody>
<tr>
<td>Ia</td>
<td>0.00 0.05 0.02 0.23 0.03</td>
</tr>
<tr>
<td>Ib</td>
<td>0.00 0.30 0.02 0.23 0.03</td>
</tr>
<tr>
<td>IIa</td>
<td>0.00 0.05 0.02 0.20 0.25 0.01 0.30 0.01</td>
</tr>
<tr>
<td>IIb</td>
<td>0.00 0.30 0.02 0.20 0.40 0.01 0.03 0.01</td>
</tr>
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MS Student: Pranjali Kumar; Advisor: Sherri Cook
Project Committee: Karl Linden, JoAnn Silverstein
Our research group promotes the development, design, & implementation of sustainable water treatment systems.

Strategically recovering resources from waste

Designing resilient environmental biotechnology systems

Safely & efficiently closing the water treatment cycle