Controlled Environment Systems
ABE 483/583

Course Description: An introduction to the technical aspects of greenhouse design, environmental control, hydroponic crop production, plant nutrient delivery systems, and intensive field production systems.

Class meeting: Tuesday 1:00 – 2:50 Lecture and Laboratory; Thursday 1:00 – 1:50 Lecture CEA Building & Greenhouses, Campbell Ave. & Roger Road

Instructor information:
Dr. Gene A. Giacomelli, Professor & Director Controlled Environment Agriculture Center, Department of Agricultural and Biosystems Engineering, Shantz Building, Room 504, cell phone 520 990-0202, and CEA Building, Room 101, 1951 E. Roger Road, Ph: 520 626-9566. Office hours: by arrangement via email giacomel@ag.arizona.edu

Grading Policy:

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<thead>
<tr>
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<th>undergraduate</th>
<th>graduate</th>
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<tbody>
<tr>
<td>Assigned homework</td>
<td>10%</td>
<td>5%</td>
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<tr>
<td>Mid-term exam</td>
<td>30%</td>
<td>25%</td>
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<td>Laboratory assignments &amp; Quiz</td>
<td>25%</td>
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<tr>
<td>Final exam</td>
<td>35%</td>
<td>25%</td>
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<td>Design project</td>
<td>0%</td>
<td>20%</td>
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Grading scale: A=90-100, B=84-89, C=78-83, D=72-78, E=66-71, F=less than 66

Assignments generally due 1 week from being assigned; 3 Credits

Attendance policy: attendance important to obtain complete understanding of the course materials. Notes will be provided, and lecture will follow notes, but will include discussion on handouts, problem examples, and on textbook and reference readings. Provide knowledge of any planned/required absences by email.


Additional references, texts and journal publications assigned as supplemental reading.
- NRAES-33, Aldrich and Bartok, "Greenhouse Engineering"
- ACME, The Greenhouse Climate Control Book
- NRAES-4, Trickle Irrigation
- NRAES-56, Water and Nutrient Management for Greenhouses
- NRAES-3, Energy Conservation for Commercial Greenhouses
- E-130, Environmental Control of Greenhouses
- E-208, Soil Heating Systems for Greenhouse Crop Production

Journals: Proceedings of National Agricultural Plastics Conferences; International Society on Soilless Culture; ACTA Horticulturae; HortTechnology; Transactions of the ASAE
Syllabus Fall 2013  
Controlled Environment Systems  ABE 483/583  
Dr. Gene A. Giacomelli  
Professor & Director  Controlled Environment Agriculture Center  
Department of Agricultural and Biosystems Engineering  
Shantz Building, Room 504, cell phone 520 990-0202  
CEA Building, Room 101, 1951 E. Roger Road, Ph: 520 626-9566  
giacomel@ag.arizona.edu

Dr Giacomelli  
Overview of Intensive Crop Production and Controlled Environment Agricultural Systems  
Greenhouse Structural Design, Glazings, Location, Orientation, Layout and Traffic Patterns  
Environmental Control - Lighting, CO₂ – Enrichment  
Environmental Control – Automated Systems  
Environmental Control – Ventilation and Cooling  
Environmental Control – Heating Systems  
Environmental Control – Floor Heating  
Energy Conservation Systems and Energy Sources  
Integrated Crop Production Systems, Plant Culture Techniques, Nutrient Delivery Systems  
Mechanization, Automation and Intelligent Mechanisms

Dr. Kacira  
Environmental Control – Psychrometrics

Dr Waller / Dr Poe  
Greenhouse Crop Production Systems – irrigation and fertigation

Lectures October 3rd & 8th, TBD, See Online videos  
Special Lecture from Korea GreenSys2013, October 10th CEAC Classroom  
Mid-Term EXAM Tuesday, October 22nd 1:00 – 2:50PM CEAC Classroom  
Final EXAM Monday, December 16th 1:00 – 3:00PM CEAC Classroom

From the Textbook  Greenhouses: Advanced Technology for protected Horticulture.  
By Joe J. Hanan

Chapter 1:  Overview of Intensive Crop Production and Controlled Environment Agricultural Systems  
Chapter 2:  Structures: Locations, Styles and Covers  
Chapter 3:  Radiation and Chapter 7, CO₂  
Chapter 4:  Temperature  
Chapter 5:  Psychrometrics (pgs. 271-276, 342-360)  
Chapter 5:  Water  
Chapter 8:  Climate Control
Course Objectives:
To learn the science and engineering aspects of controlled environment plant production systems [CEPPS].
To learn procedures, techniques and available resources for the design, evaluation, operation and general understanding of CEPPS.
To become familiar with the generalized processes and sub-systems of a CEPPS, including, crop production systems; nutrient delivery systems; microclimate heating, ventilation, cooling, humidifying, supplemental lighting and CO₂ enriching systems; monitoring and control systems; energy conservation and alternate energy systems; mechanization and labor management systems; glazing systems; and types of structures.
To appreciate the importance of integrating the biological aspects of plant production with engineering design for the successful operation of a CEPPS.

First Homework Assignment is shown below
Please return to Dr Giacomelli by email by September 3rd  giacomel@ag.arizona.edu

Your description.......  
Who are You?  Why are You Here?  Where are You going?

Name: 
Program: 
Year in Program: 
Undergraduate/Graduate: 
Preferred E-Mail: 
   [this is very important as communication and class assignments will be provided by email!]
Phone [optional]: 

Answer these 4 questions:
1. What are your goals and expectations for this class?
2. How will this class be important for your academic program and/or your future profession?
3. In your terms, as you now know and perceive, how you would describe:  
   [1] a ‘plant’
4. Can you perceive how CEA (controlled environment agriculture) systems can be utilized to feed the world, improve the environment of the world, and create new worlds?  
   If you have some thoughts on this, briefly explain.