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

		undergraduate	graduate
Grading Policy:	Assigned homework	10%	5%
	Mid-term exam	30%	25%
	Laboratory assignments & Quiz	25%	25%
	Final exam	35%	25%
	Design project	0%	20%

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 or text or voice.

Textbook: Greenhouses: Advanced Technology for protected Horticulture. By Joe J. Hanan
[optional, will make a good reference book]

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 2016
Controlled Environment Systems ABE 483/583

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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, CO_2– 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 [TBD]
Environmental Control – Psychrometrics

Dr Poe and Dr Tollefson -- [TBD]
Greenhouse Crop Production Systems – irrigation and fertigation

Some lectures to be provided remotely or by online videos.

Mid-Term EXAM Tuesday, October 18th 1:00 – 2:50PM CEAC Classroom
Final EXAM Tuesday, December 13th 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, CO_2
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 CO_2 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.