

Schedule is subject to change

January 2016 UA/CEAC Intensive Greenhouse Crop Production Course

1951 East Roger Road, Tucson, AZ 85719

<http://ceac.arizona.edu/> 520-626-9566

EMPHASIS ON TOMATOES: Instructor – Patricia A. Rorabaugh, Ph.D.

The tomato course will use the PLS 217 class manual as a reference.

Course materials: Flash drive with PLS 217 manual, power points
Folder with handouts, loupe & supplies

SUNDAY January 3, 2016 – Tomato

- 3:00 – 5:30 pm Check-in at the CEAC – CEAC Classroom
- 5:00 – 5:30 pm Brief tour of the CEAC / CAC facilities
- 5:30 – 6:30 pm Light dinner at CEAC – CEAC Classroom
- 6:30 – 8:00 pm Introduction to CEA and Hydroponics – CEAC Classroom
- A little history (Chapter 1)
 - The plant and its needs (Chapters 2, 3)
 - Basic hydroponic systems (Chapter 5)

MONDAY January 4, 2016 – Tomato

- 9:00 – 9:15 am Discussions and questions from previous day – CEAC Classroom
- 9:15 – 10:00 am A bit about plant propagation (Chapter 6) – CEAC Classroom
- 10:00 – 11:00 am Tour of the Controlled Environment Agriculture Center (CEAC) including:
- Mist house (more on plant propagation)
 - Teaching Greenhouse (intro to the greenhouse, control systems, experiment, greenhouse set-up) (Chapter 3)
 - Tomato plant rep assignments for the course
- 11:00 – 12:00pm Greenhouse set-up (Chapter 3) – CEAC Classroom
- Basic components including environmental settings
 - Crop layout
 - Crop scheduling
- 12: 00 – 1:00 pm Lunch provided – CEAC Classroom
- 1:00 – 2:00 pm Crop maintenance – Emphasis on tomatoes (Chapter 3) – CEAC Classroom
- Training & pruning
 - Physiological disorders – leaves, stems, trusses (briefly, fruit)
 - Factors controlling plant architecture

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- 2:00 – 4:00 pm Plant work: crop training & pruning – CEAC Teaching Greenhouse
- Finding the tomato head – Stem clipping & pruning
 - Nodes, internodes and location of leaves & clusters on the stem
 - Leaning & Lowering – proper techniques
- 4:00 – 5:30 pm Controlling plant architecture – CEAC Teaching Greenhouse
- “Steering” your plants to success (Chapter 3)
 - Exercise: recognizing vegetative vs reproductive characteristics
- 5:30 pm Dinner on your own

TUESDAY January 5, 2016 – Tomato

- 9:00 – 9:15 am Discussion and questions from previous day – CEAC Classroom
- 9:15 – 10:00 am Crop registration forms – CEAC Classroom
What to measure & what it means
- 10:00 am – 12:00 pm Crop registration – measurements – CEAC Teaching Greenhouse
Analysis of measurements
- 12:00 – 1:00 pm Lunch provided – CEAC Classroom
- 1:00 – 2:30 pm Flowers, pollination and the fruit – CEAC Classroom
- Bee hives / bee management (Chapter 7)
 - Cluster maintenance (Chapter 8)
 - Fruit problems (fresh fruit & Chapter 3)
 - Harvest / grading / storage (Chapter 8)
- 2:30 – 4:00 pm Harvesting and grading – CEAC Teaching Greenhouse
- Individual versus cluster (TOV) harvesting
 - Fruit categories including fruit problems
 - Weighing & record keeping
 - Types of packaging
- 4:00 – 5:30 pm Flowers to fruit – CEAC Teaching Greenhouse
- Exercise: Pollination % calculations – are the bees working?
 - Cluster maintenance – pruning & clipping
- 5:30 pm Dinner on your own.

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WEDNESDAY January 6, 2016 - Tomato

- 9:00 – 9:15 am Discussions and questions from previous day – CEAC Classroom
- 9:15 – 12:00 pm Plant protection – CEAC Classroom (Chapter 4)
- Introduction to the pests: Insects, Mites & Diseases
 - Integrated pest management (IPM)
- 12:00 – 1:00 pm Lunch provided – CEAC Classroom
- 1:00 – 2:00 pm Plant work – CEAC Teaching Greenhouse
- Leaves & leaflets – Removing lower leaves, how and why.
- 2:00 – 4:00 pm Plant protection / Keeping plants healthy – CEAC Teaching Greenhouse
- Exercise: Pest ID & scouting
 - Record keeping for pest problems
- 4:00 – 5:30 pm A bit about business – CEAC Classroom
- Costs & sources for tomato production items
 - Introduction to GHP / GAP certification notebooks for tomato
- 5:30pm Dinner on your own

THURSDAY January 7, 2016 – Tomato

- 9:00 – 9:15 am Discussion and questions from previous day
- 9:15 – 11:00 am Plant nutrition basics – CEAC Classroom
- Tomato nutrients & deficiencies (Chapter 9)
 - Nutrient delivery systems (Chapter 10)
- 11:00am – 12:00 pm TOUR: Nutrient delivery systems in different greenhouses
- 12:00 – 1:00 pm Lunch provided
- 1:00 – 3:00 pm Nutrient recipes & calculations (Chapter 10) – CEAC Classroom
- Exercise: nutrient solution calculations
- 3:00 – 4:00 pm Making the concentrated solutions – CEAC Teaching Greenhouse
- Components (keeping things separate), weighing & mixing the tanks
- 4:00 – 5:30 pm Group Ex. - What's the problem here? Plus Q & A – CEAC Classroom
- 5:30 pm Dinner on your own

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EMPHASIS ON Tomato continues

EMPHASIS ON Lettuce begins: Instructor – Myles Lewis

The lettuce course will use presentations, spreadsheets, and other handouts provided on a flash drive. Hands-on work will be conducted in the greenhouse by students.

FRIDAY January 8, 2016 – Combined Tomato & Lettuce

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| 8:00 – 9:00 am | Check-in for Lettuce Attendees – CEAC Classroom
Discussion and questions from previous day for Tomato Attendees |
| 9:00 – 11:00 am | Greenhouse Basics (Rorabaugh) <ul style="list-style-type: none">• Greenhouse site selection (Chapter 11)• Greenhouse designs & materials (Chapter 12)• Environmental control – including sizing heaters & fans (Chapter 13)• A bit about greening the greenhouse (Chapter 14) |
| 11:00 – 12:00 pm | Round table discussion with greenhouse engineers
Includes professors of Agricultural & Biosystems Engineering Department at The University of Arizona and CEAC / CAC personnel (as available): <ul style="list-style-type: none">• Will include Gene Giacomelli, Ph.D. and Murat Kacira, Ph.D. |
| 12:00 – 1:00 pm | Lunch provided & <i>Round table continues</i> – CEAC Classroom |
| 1:00 – 2:30 pm | Environmental control requirements (Rorabaugh & Lewis) <ul style="list-style-type: none">• Set-points (both tomato & lettuce)• How the environment effects the plants and vice versa• Real-time monitoring – CEAC/tomatoes live• Deciphering your greenhouse – “Virtual Grower” |
| 2:30 – 4:30 pm | Food safety & GHP/GAP certification (Lewis) <ul style="list-style-type: none">• Safe production & handling procedures |
| 4:30 pm | <u>Groups separate:</u> |
| 4:30 – 5:45 pm | <u>Tomato Group</u> – CAC Headhouse & CEAC Teaching Greenhouse <ul style="list-style-type: none">• Peer review of plant work• Tomato course wrap – up: Q & A |
| 4:30 – 5:45 pm | <u>Lettuce Group</u> – CEAC Classroom <ul style="list-style-type: none">• Introduction to the lettuce intensive• Tours of lettuce production systems / Pros & cons |
| 6:00 – 8:00 pm | Dinner provided by CEAC for all attendees of BOTH groups <ul style="list-style-type: none">• Dinner speaker: Merle Jensen, Ph.D. |

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SATURDAY January 9, 2016 – Lettuce

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| 8:00 – 8:30 am | Check-in for Lettuce Attendees – CEAC Classroom
Discussion and questions from previous day |
| 8:30 – 10:00 am | Greenhouse basics and system options for lettuce and herbs – CEAC Classroom & Greenhouse <ul style="list-style-type: none">• Greenhouse site selection• Designs & materials of structure• Types of growing systems – advantages & disadvantages |
| 10:00 – 11:30 am | Environmental control & system maintenance and monitoring – CEAC Classroom & Greenhouse <ul style="list-style-type: none">• Set-points and setup• Monitoring methods• System maintenance |
| 11:30 – 12:30 pm | Lunch & Discussion |
| 12:30 – 1:30 pm | Propagation - Greenhouse <ul style="list-style-type: none">• Substrate choices and starting materials• Seeds and seeding• Germination conditions• Scheduling |
| 1:30 – 3:00 pm | Growing - Greenhouse <ul style="list-style-type: none">• Nutrition• Spacing and layout• Crop maintenance and monitoring• Harvesting |
| 3:00 – 3:45 pm | Post-harvest & Food safety – Greenhouse and CEAC Classroom <ul style="list-style-type: none">• Post-harvest procedures• Packaging, storage, and shipment• Food safety procedures |
| 3:45 – 4:30 pm | IPM, Disease, and deficiencies – CEAC Classroom <ul style="list-style-type: none">• Common pests and treatment procedures• Diseases common to production• Nutrient deficiencies |

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SUNDAY January 10, 2016 – Lettuce PLUS Tucson Farmer’s Market Tour w/ Myles Lewis

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| 8:00 – 9:30 am | Economics of production – CEAC Classroom <ul style="list-style-type: none">• Materials costs and consumption• Operating costs• Financials |
| 9:30 – 10:30 am | Meet at the CEAC Classroom
Visit to Tucson Farmer’s Market (within walking distance)
Activity: Market Survey & How to market your produce to the public |
| 10:30 – 11:30 am | Business Plans, Marketing, and sales – CEAC Classroom <ul style="list-style-type: none">• Business planning• Marketing• Customers and selling |
| 11:30 – 12:30 pm | Certifications & GHP / GAP – CEAC Classroom <ul style="list-style-type: none">• GHP / GAP• Certified Naturally Grown, Organic, and other labels• Audits, check-ups, and maintenance of certifications |
| 12:30 – 1:30 pm | Wrap – up with lunch & discussion - CEAC Classroom |
| 1:30 pm | End program |