

FOS 5561C - Citrus Processing Technology Syllabus, fall 2009

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Time: Monday periods 4-5, Wednesday period 4

Location: Lake Alfred Students: Lectures Ben Hill Griffin Hall conference room, teaching lab. Labs and demonstrations: CREC pilot plant
 Gainesville students: FSHN Room 362 (via Polycom)

Office hours: Monday 2:00 – 5:00 pm Friday 3:00 – 5:00 pm

Text (recommended)

Braddock, R.J.: *Handbook of Citrus By-products and Processing Technology* (1999), John Wiley & Sons.

Kimball, D. A. *Citrus Processing. A Complete Guide*, 2nd Ed. (1999), Aspen.

Other References

McCabe W., Smith, J., Harriott P. *Unit Operations of Chemical Engineering, 7th Ed.* (2005), McGraw-Hill

Singh, R.P., Heldman, D.R. *Introduction to Food Engineering*, 4th Ed. (2008), Academic Press.

General Objectives

- To familiarize students with citrus processing technology and with the operation of citrus processing plants.
- To describe the scale of the US citrus processing industry and analyze current trends and challenges
- To understand the principles of operation of the main citrus processing equipment
- To learn and apply mass balances around the main citrus unit operations
- To learn the fundamentals of flow of fluids and the flow properties of orange juice
- To analyze the effects of processing on orange juice safety
- To characterize the impact of processing on the quality of citrus products

Course Grading

- 3 Exams 50%
- 3 Reports 30%
- Homework 10%
- Short review paper 10%

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E
95 - 100%	90 - 94%	85 - 89%	80 - 84%	75 - 79%	70 - 74	65 - 79%	60 - 64	55 - 59%	50 - 54	45 - 50%	< 45%

Homework and laboratory reports turned in late will be penalized with 20% of the maximum grade per week of delay. Similarly, a credit of 20% of the maximum grade will be given per week if homework and reports are not graded by the instructor within a week.

Attendance

Students must attend all lectures. Two justified absences are acceptable. Upon request by the student, the instructor will arrange for make-up exams and lectures for justified absences. The Non-justified absences and absences in excess of two will be penalized each with 5% off the maximum final grade.

Calendars

Lectures (Field trips and laboratories take two additional weeks)

Week	Lecture Topic
1	Introduction History, Geography, Economics, Seasons and Varieties Introduction to engineering calculations I Units and mass balances
2	Harvest and Postharvest Packing House operations Introduction to engineering calculations II Viscosity
3	Fruit quality and composition Introduction to engineering calculations III Bernoulli's equation
4	Handling for Processing Introduction to engineering calculations IV Friction, turbulence and pump power requirements
5	Juice extraction and State test proc. Exam 1
6	Solution to Exam 1 problems Finishing and centrifugation In-class engineering calculations exercises
7	NFC Properties and storage*
8	Microbiology / HACCP ⁺ Introduction to engineering calculations V Energy balances/ heat exchangers
9	Enzymes and Enzyme inactivation Evaporation
10	Training for Exam 2. In-class exercises
11	Exam 2 /
12	Solution to Exam 2 problems/ By-products, Essential oils and d-Limonene Introduction to engineering calculations VI CIP design/ Instrumentation Automation and Control
13	Emerging technologies/ Questions and answers for final exam
14	Final Exam

*Taught by Dr. Renée Goodrich; ⁺Taught by Dr. Michelle Danyluk; [#]Laboratory or pilot plant demonstrations descriptions need to be read and understood prior to execution.

Laboratory and Pilot Plant Experiments

Week	Topic
1	Library resources: (optional) Search of Citrus Production and Economic Information Search of Scientific Databases
3	Measurement of viscosity of single strength and concentrated orange juice
4	Fruit quality & composition
TBD	Sizing, State test procedures [#] Finishing and Centrifugation [#] Pulp analyses [#]
11	Evaporation & Essence Rec. [‡] Scott Oil Analysis,
TBD	Feed mill [#] Pectin Esterase inactivation [#]

Hands on experiments at the CREC

‡ Real time remote laboratory Web-based

Field Trips (Wednesday afternoon)

Date	Location
TBD	Visit to FMC (Lakeland)
TBD	Visit to Citrus Processing Plant (Lake Wales)

Term paper

Date	Component
09/09	Topic / preliminary title
09/23	Introduction
10/14	Existing technology
11/11	Current research
11/25	Future Trends
12/09	Abstract and full paper

Document formatting

1. Homework

Can be hand-written

First page with results of all numerical calculation exercises

Show all calculations in the following pages

2. Lab report (4-6 pages, 12 pt Times New Roman, single space, not including references)

Typed except for equations and calculations

Executive summary (typed, maximum half a page, 15 points)

- Introductory sentence about the purpose of the experiment/demonstration.
- Relevant results and why these results are relevant. *Include some numerical results but only the most relevant or extraordinary (i.e. unexpected).*
- Concluding sentence about the meaning of the results obtained and their practical usefulness. *Why is this lab relevant, why the experiment/demonstration results are important*

Materials and methods (typed, 1 page, 10 points)

- Description of the materials, equipment and instrumentation used including model and manufacturer
- Complete description of the methods used
- Diagram. *I am expecting this, in particular for mass balances.*

Experiment results (data in tables or graphs 1 page, 10 points). *Figures and tables need to have captions and need to be numbered. Also, you must refer to them in your discussion section. I expect all your experiment results in 1, maximum 2 pages.*

Calculations (can be hand-written (*very clear and clean*), explicit equations, calculation procedures and values used, 1-2 pages, 50 points) *Always check for unit consistency.*

Discussion (Were the results expected? Does theory describe the data? Can a mathematical function describe the data? Were experiments reproducible? Compare with the literature, 1 page, 15 points) *Make sure you reply to all these questions at least*

References (1 extra point for a minimum of 2 adequate references) *“Adequate” means here references to scientific literature. You must also cite any other source from which you obtained information including web sites.*

3. Short review paper (4-6 pages, 12 pt Times New Roman, single space, not including references)

Abstract (200 words 15 points)

The abstract or executive summary must summarize the most relevant information found in the literature and relevance of the topic. The reader should get interested in reading the rest of the paper.

Introduction (half a page 15 points)

This section should describe the topic you are reviewing and put it into context. It should include:

- The need of the technology
- Brief history of the technology
- Relevance (current economic and practical impact)
- Objective of the review

Old research and Existing Technology (half a page 20 points)

This section includes findings from research older than 10 years and a description of currently available systems (based on old research) and critical comparison (i.e. pros and cons). List of manufacturers.

Current Research (10-20 references 1995 to 2007, 2-4 pages 40 points)

Use search databases available through the University of Florida Library System. I recommend the following

- ISI Web of Science
- Science Direct
- Article First
- FSTA

Future Trends (half a page 10 points)

After reading the literature, in your opinion, what needs are being addressed? What aspects of the topic should be addressed in the short and medium terms?

Databases and keywords

Typed, 1/2 to 1 page, in table format. No credit is given for this but up to *10 points will be deducted* in the absence Example

Database	Keywords	# articles
FSTA	Orange juice pasteurization	56
	High pressure pasteurization	13
	Enzyme inactivation	64
	Pectinesterase	28
	Etc.	...

Syllabus changes

The instructor reserves the right to modify this syllabus to preserve the integrity of this course

Academic Honesty

In 1995 the UF student body enacted a new honor code and voluntarily committed itself to the highest standards of honesty and integrity. When students enroll at the university, they commit themselves to the standard drafted and enacted by students. In adopting this honor code, the students of the University of Florida recognize that academic honesty and integrity are fundamental values of the university community. Students who enroll at the university commit to holding themselves and their peers to the high standard of honor required by the honor code. Any individual who becomes aware of a violation of the honor code is bound by honor to take corrective action. The quality of a University of Florida education is dependent upon community acceptance and enforcement of the honor code.

The Honor Code: We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.

On all work submitted for credit by students at the university, the following pledge is either required or implied: **“On my honor, I have neither given nor received unauthorized aid in doing this assignment.”**

The university requires all members of its community to be honest in all endeavors. A fundamental principle is that the whole process of learning and pursuit of knowledge is diminished by cheating, plagiarism and other acts of academic dishonesty. In addition, every dishonest act in the academic environment affects other students adversely, from the skewing of the grading curve to giving unfair advantage for honors or for professional or graduate school admission. Therefore, the university will take severe action against dishonest students. Similarly, measures will be taken against faculty, staff and administrators who practice dishonest or demeaning behavior. Students should report any condition that facilitates dishonesty to the instructor, department chair, college dean or Student Honor Court.

(Source: 2007-2008 Undergraduate Catalog)

It is assumed all work will be completed independently unless the assignment is defined as a group project, in writing by the instructor. This policy will be vigorously upheld at all times in this course.

Software Use:

All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

Campus Helping Resources

Students experiencing crises or personal problems that interfere with their general wellbeing are encouraged to utilize the university's counseling resources. Both the Counseling Center and Student Mental Health Services provide confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance. The Counseling Center is located at 301 Peabody Hall (next to Criser Hall). Student Mental Health Services is located on the second floor of the Student Health Care Center in the Infirmary.

- *University Counseling Center*, 301 Peabody Hall, 392-1575, www.counsel.ufl.edu
 - *Career Resource Center*, CR-100 JWRU, 392-1602, www.crc.ufl.edu/
 - *Student Mental Health Services*, Rm. 245 Student Health Care Center, 392-1171, www.shcc.ufl.edu/smhs/
- Alcohol and Substance Abuse Program (ASAP)
Center for Sexual Assault / Abuse Recovery & Education (CARE)
Eating Disorders Program
Employee Assistance Program
Suicide Prevention Program

Students with Disabilities

The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. 0001 Reid Hall, 392-8565, www.dso.ufl.edu/drc/