

**Department of Agricultural and Biological Engineering
University of Florida**

**Agricultural Operations Management 5334C
Agricultural Chemical Application Technology
Fall, 2023 (Class Number 10505, Section 092A)**

Catalog Description: AOM 5334C Agricultural Chemical Application Technology. F. **Credits:** 3. Equipment and methods used to apply pesticides in agriculture. Emphasis on techniques to avoid misapplication and pesticide drift.

Prerequisite: Graduate standing in the College of Agricultural and Life Sciences and other related disciplines or instructor approval. Minimum technical skills include basic math and logical thinking skills.

Instructor: Dr. Wonsuk "Daniel" Lee
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<https://abe.ufl.edu/people/faculty/wonsuk-lee/>

Lab TA: Mr. Michael Zingaro
ABE Machine Shop (Steel Building)
(352) 392-9771, zgator1@ufl.edu

Lecture Hours : M W 1:55 PM – 2:45 PM (7th period). Frazier Rogers Hall, Room 110 (M) & 129 (W).

Laboratory Hour: W 3:00 PM – 4:55 PM (8th-9th periods). Frazier Rogers Hall, Room 129, and various other locations. As there are eight lab exercises, sometimes lectures will be given instead.

Course homepage: <https://elearning.ufl.edu>. Course lecture notes will be available on the course website.

Office Hours: I have an open-door policy. You are welcome to visit me whenever I am available or by appointment.

Text: *SM 53 Private Applicator Agricultural Pest Control*, 4th Edition, by Frederick M. Fishel, UF/IFAS Communication Services, Revised 2019. (<http://ifasbooks.ifas.ufl.edu/p-118-private-applicator-agricultural-pest-control.aspx>). See the UF/IFAS Bookstore map on the last page.

SM 1 Applying Pesticides Correctly: A Guide for Pesticide Applicators (CORE), 7th Edition, by Frederick M. Fishel, UF/IFAS Communications Services, 2014 (Revised for 2015, <http://ifasbooks.ifas.ufl.edu/p-104-applying-pesticides-correctly-a-guide-for-pesticide-applicators-core.aspx>)

: You will summarize each chapter every week during the first 9 weeks, so that you can use the summary to (1) learn the basic knowledge by yourself and (2) take a pesticide application license exam in the future. Every Monday, **starting Sep. 11th**, you must submit a summary of each chapter in the E-Learning. Start with "Terms to Know" and include all sub-sections of each chapter.

Course Objectives:

1. To be familiar with agricultural pests and the measures for controlling them
2. To understand different sprayer components and learn how they work
3. To be able to properly calibrate different types of spray equipment. Special emphasis will be placed on using the proper equipment and techniques for applying pesticides.
4. To become familiar with pesticide laws, labels, and safety

Lecture Topics:

Pest identification and control	Pumps
Nozzles and flow rate formula	Granule applicators and calibration
Sprayer components	Spray drift
Calibration of farm sprayers	Aquatic weed control
Pesticide formulation and arithmetic	Pesticide laws, labels, and safety
Variable rate application (VRA)	

Laboratory Topics:

General purpose boom sprayer	Pumps
Nozzles and spray patterns	Granule applicator
Sprayer calibration	Aerial application
Airblast sprayers	Variable rate application (VRA)

Course Schedule (Dates are approximate)

Week (Date)	Lecture (Mon & Wed)	Lab (Wed)	Quiz	SM1 Summary	HW	Test
1 (8/23)		Module 1 – Pest identification and control				
2 (8/28)	(Continue Module 1)	Lab 1 – General purpose farm sprayer				
3 (9/4)	Labor Day Holiday	Module 2 – Nozzles and flow rate formula			#1	
4 (9/11)	(Continue Module 2; Solve HW #1)	Lab 2 – Nozzle pressure vs. flow rate and spray patterns	#1	Ch. 1		
5 (9/18)	Module 3 – Sprayer parts and calibration	Test 1 (No Lecture & Lab)	#2	Ch. 2		Test 1
6 (9/25)	(Continue Module 3)	Lab 3 – Calibration of a general purpose farm sprayer	#3	Ch. 3		
7 (10/2)	Module 4 – Pesticide formulation and arithmetic	Lab 4 – Aerial pesticide application	#4	Ch. 4	#2	
8 (10/9)	(Continue Module 4)	Lab 5 – Airblast sprayer calibration and other activities at PSREU	#5	Ch. 5		
9 (10/16)	Module 5 – Pumps	Solve HW #2	#6	Ch. 6		
10 (10/23)	Module 6 – Granule applicators	Test 2 (No Lecture & Lab)	#7	Ch. 7		Test 2
11 (10/30)	Module 7 – Drift and aquatic weed control	Lab 6 – Pumps	#8	Ch. 8		
12 (11/6)	(Continue Module 7)	Lab 7 – Granular application	#9	Ch. 9	#3	
13 (11/13)	Module 8 – Laws, labels, and safety	Pesticide applicator license exam - Category	#10			
14 (11/20)	Pesticide applicator license exam - Core	Thanksgiving!	#11			
15 (11/27)	Module 9 – Variable Rate Technology (VRT); Solve HW #3	Lab 8 – VRT	#12			
16 (12/4)	(Continue Module 9 and HW #3)	Test 3 (No Lecture & Lab)				Test 3

Course grading will be based on the following items:

1. **Quizzes** will be given every Monday at the end of the lecture. The quiz problems are from the previous week's lecture, lab exercise, and/or homework. Quizzes will help you study course materials and achieve course objectives. Quizzes cannot be made up.
2. **Lab Assignments** will be handed out for every laboratory session. They will help you better understand the goals of lab exercises and facilitate opportunities to work on the calibration of various sprayers. Lab assignments should be submitted in the E-Learning.
3. **Homework** – Three sets of problems related to the calibration of pesticide application equipment will be assigned. The problems will be similar to calibration problems given on the quizzes and tests. The support numbers needed to arrive at the problem answer must be shown on the homework paper. You will receive credit if you have tried to solve them. Homework problems are from actual spray applications and help you practice solving real situations for sprayer calibration. Homework should be submitted in the E-Learning.
4. **Tests** – There will be three (3) tests. There will not be a comprehensive final examination. The test could have calculation problems similar to those in the previous test(s), but verbal questions will be tested only once. Tests will help review course materials and practice more calibration problems toward achieving course objectives.
5. **SM1 Summary** – Start with “Terms to Know” and include all sub-sections of each chapter. SM1 summary helps you understand the core information of pesticide application, which we don't cover during lectures and lab exercises. Every Monday, **starting Sep. 11th**, you must submit a summary of each chapter in the E-Learning.
6. **Review Paper** – Choose a topic of interest related to pesticide application technology and write a review paper. You will have an opportunity to present your paper near the end of the semester.
7. **All assignments should be submitted in the E-Learning. You will need to submit them at least a few minutes before class time so that you can attend class on time.** Email submissions will NOT be accepted.
8. **Late submission policy:** All assignments are due at the beginning of the class. Thereafter 10% reduction/business day. See page 7 for more information.

Tests: Test 1: Wed, Sep. 20 Test 2: Wed, Oct. 25 Test 3: Wed, Dec. 6

Grading will be based on the following assignment of weights:

Tests:	20% each	91.0 – 100%	A	72.0 – 75.9%	C
Quiz:	10%	89.0 – 90.9%	A-	69.0 – 71.9%	C-
Lab assignment:	10%	86.0 – 88.9%	B+	66.0 – 68.9%	D+
Homework:	5%	82.0 – 85.9%	B	62.0 – 65.9%	D
SM1 summary:	5%	79.0 – 81.9%	B-	59.0 – 61.9%	D-
Review paper:	10%	76.0 – 78.9%	C+	Below 59.0%	E

Please be aware that the E-Learning gradebook uses the grading scheme for the undergraduate portion of this course and may not reflect your grade correctly. Please get in touch with me for the correct grade.

Grades and Grade Points: For information on current UF policies for assigning grade points, see <https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/>.

Attendance and Make-Up Work: Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found at: <https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>.

Services for Students with Disabilities: Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the Disability Resource Center. [Click here to get started with the Disability Resource Center.](#) It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

Online Course Evaluation Process: Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

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.

Academic Honesty: UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: **“On my honor, I have neither given nor received unauthorized aid in doing this assignment.”** The Honor Code specifies a number of behaviors that are in violation of this code and the possible sanctions. [Click here to read the Honor Code.](#) Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

In-Class Recording: Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

Canvas Technology Requirements: Computers, Internet, and Web browsers: Canvas runs on Windows, Mac, Linux, iOS, Android, or any other device with a modern web browser. It is recommended to use a computer less than five years old with at least 1GB of RAM. It is recommended to have a minimum Internet speed of 512kbps. It is **strongly recommended** to not use a wireless connection, phone, tablet, or notepad for critical course tasks such as exams and discussions.

Canvas currently supports the following browsers: Chrome, Safari, Firefox, Edge. Canvas supports the last two versions of most browsers. It is **highly recommend** updating to the newest version of whatever browser you are using. Note that your computer’s operating system may affect browser function. Failure to use one of these browsers will cause problems.

For more information on approved computers and browsers please visit:

<https://community.canvaslms.com/t5/Canvas-Basics-Guide/What-are-the-browser-and-computer-requirements-for-Canvas/ta-p/66>. On this web page there is an area titled “Is My Browser up to Date?” Use it to check each computer and browser you may use in this course. There is another important area on “Browser Privacy Settings.” Read the section(s) for any browser intended for use. For example, **Note that:** In browsers such as Safari, insecure content will never be displayed in the browser. Return to the page to check for updates on technology issues in Canvas.

If you encounter technical difficulties in this course, **contact the UF Computing Help Desk** right away to troubleshoot. <https://helpdesk.ufl.edu/> or (352) 392-HELP. If the problem cannot be fixed immediately, **notify your instructor, and provide them with the Help Desk ticket number.**

Campus Resources: Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university’s counseling resources.

Health and Wellness

- *U Matter, We Care:* If you or someone you know is in distress, please contact umatter@ufl.edu, 352-392-1575, or visit [U Matter, We Care website](#) to refer or report a concern and a team member will reach out to the student in distress.
- *Counseling and Wellness Center:* [Visit the Counseling and Wellness Center website](#) or call 352-392-1575 for information on crisis services as well as non-crisis services.
- *Student Health Care Center:* Call 352-392-1161 for 24/7 information to help you find the care you need, or [visit the Student Health Care Center website](#).
- *University Police Department:* [Visit UF Police Department website](#) or call 352-392-1111 (or 9-1-1 for emergencies).
- *UF Health Shands Emergency Room / Trauma Center:* For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; [Visit the UF Health Emergency Room and Trauma Center website](#)
- *GatorWell Health Promotion Services:* For prevention services focused on optimal wellbeing, including Wellness Coaching for Academic Success, visit the [GatorWell website](#) or call 352-273-4450.

Academic Resources

- *E-learning technical support:* Contact the [UF Computing Help Desk](#) at 352-392-4357 or via e-mail at helpdesk@ufl.edu.
- *Career Connections Center:* Reitz Union Suite 1300, 352-392-1601. Career assistance and counseling services.
- *Library Support:* Various ways to receive assistance with respect to using the libraries or finding resources.
- *Teaching Center:* Broward Hall, 352-392-2010 or to make an appointment 352-392-6420. General study skills and tutoring.
- *Writing Studio:* 2215 Turlington Hall, 352-846-1138. Help brainstorming, formatting, and writing papers.
- *Career Resource Center,* First Floor JWRU, 392-1601, <https://career.ufl.edu/>.
- *Student Complaints On-Campus:* [Visit the Student Honor Code and Student Conduct Code webpage for more information](#)
- *On-line Students Complaints:* [View the Distance Learning Student Complaint Process.](#)

Review Paper

You are required to write a review paper for this course. You can select any topic related to the course contents. The following are potential journals where you can find related articles. A review article should include at least 50 research articles to describe the current status of the topic of your choice and make some recommendations for future directions. The goal is to publish your review article in a journal.

- Transactions of the ASABE
- Biosystems Engineering
- Applied Engineering in Agriculture
- Journal of Agricultural Safety and Health
- Precision Agriculture
- Computers and Electronics in Agriculture
- Sensors
- ...

The deadlines for a review paper are below. Email me your submissions.

- Outline (30 pts, due Monday, Sep. 11): Describe your topic of interest including a title and summary. Please feel free to consult with me about your topic of interest.
- Progress report (70 pts, due Monday, Oct. 16): Submit your partially completed review paper including the title, introduction, summary of identified articles, and reference information.
- Final report (100 pts, due Monday, Nov. 20): Submit your completed final paper by email (wslee@ufl.edu) and PowerPoint presentation. You will present your article during class at the end of the semester for about 10-15 min.

Once you complete it, you will submit it to a journal for publication.

Assignment submission guidelines – the following rules will be strictly enforced!

- Submit on time, i.e., “at the beginning of the class”!
- Since the class starts at 1:55 pm, one-day late submission starts from 1:56 pm until 1:55 pm the next day (24-hour period).
- Example 1: If your assignment is due Monday and you submit it at 2 pm on Monday, your submission is considered to be 1-day late (10% deduction). (I am sorry about this strict rule, however have to enforce the rule fairly for all of you.)
- Example 2: If your assignment is due Monday and you submit it at 3 pm on Tuesday, your submission is considered to be 2-days late (20% deduction).
- If you show any extra effort on your assignments and activities in lecture and lab exercises, there is a high potential for **extra credit**.

IFAS Extension Bookstore

