PSS 221 Sustainable Orchard Management

Fall 2020, Wednesdays, Aug 30 – Dec 11. 1:10 – 5:00 PM.

Class will meet at UVM Horticulture Research & Education Center, 65 Green Mountain Dr, South Burlington, VT
On-campus classroom is Morrill Hall 010 (Inclement weather site)

Dr. Terence Bradshaw tbradsha@uvm.edu. (802) 922-2591

Office hours: Thurs 9:30-12:00. Jeffords 210

Appointments preferred. I am also available other times, please email to schedule.

Pre/Co-requisites: PSS 10 or PSS 21 or BIOL 001 or 002 or BCOR 011 or BCOR 012; and PSS 161; or permission.

Course Modality

This course is being offered as an *In-Person* format. Most lectures and other materials will be posted to Blackboard (see below) with weekly meetings in the orchard as allowed by weather. **Students must find transportation to the UVM orchard on meeting days**. Students will need to sign transportation waivers for this course. *If a student has transportation needs, we will work on reserving department vans or using the UVM Catsride shuttle to assist with getting to the farm.* We have a tent for use at the farm, but may meet on-campus for some material if weather is inclement. Always check Blackboard for each week's plans.

Course Description

Students will learn principles and practices of commercial orchard crop production, including: site selection and preparation; cold hardiness development; varietal selection; tree and vine training and trellising systems; nutrient, water and pest management; harvest and postharvest considerations. Special emphasis will be placed on environmental and economic sustainability of fruit production systems. The course will cover orchard crops suitable for production in northern New England, and students will have opportunities to explore specific crops in greater depth if they so wish. At each course meeting, we will apply knowledge of integrated horticultural and pest management practices in a real farm setting. The course format will consist of a combination of remote or classroom lectures, hands-on fieldwork, and visits to local commercial orchards.

Overall Course Learning Objectives

Students enrolled in this course will:

1. attain a basic level of knowledge of tree fruit botany and specific conditions required for crop production.
2. develop an understanding of the horticultural and farm-management practices required to successfully operate an orchard in Vermont.
3. learn critical concepts and methods for crop protection, including organic methods and with an emphasis on Integrated Pest Management
4. engage critically with class material and make connections with how these drivers shape orchard systems and inform on-farm decision making.
5. Students will apply their knowledge and develop a farm plan which can be used for many potential purposes including monitoring and evaluation, applications for financing, etc.

There are specific learning objectives for each weekly module. See Course Schedule for more details.

Contacting course instructors or TAs:

The default method for contacting the course instructor or TA is via email.
All emails should begin with the subject line "[PSS 221]…"
This will allow for incoming messages to get flagged and not missed in overstuffed inboxes. Please use professional language in emails. Text messaging is not an appropriate method for communication with instructors and teaching assistants. My

personal cell phone number is listed at the top of this syllabus, use it only in an emergency and not during or immediately prior to class meeting time.

Course Structure and Pedagogy

Class format will consist of a combination of asynchronous online lectures, at-farm demonstrations and activities, and synchronous course meetings on MS Teams.
While this course is listed as on-campus, we will try to get out to orchards every day possible. Our primary 'home orchard' is located at the UVM Horticulture Research and Education Center, 65 Green Mountain Drive, South Burlington, VT.

Pedagogy will employ a combination of readings, lectures, homework, in-class exercises, planning assignments, and peer review. Students are expected to be resourceful in acquiring the relevant evidence to support their homework assignments and final class project.

Required Course Materials:

Appropriate course readings will be posted on Blackboard. There is no required text for this course.

Sources and Citations

All work must include appropriate citations. Please consider the quality of sources and provide complete information in APA format (https://owl.english.purdue.edu/owl/section/2/10/). Websites may be acceptable sources of information, but consider blogs, sites without credited authors, and commercial sites as lower in quality than reputable University, Extension, and government sites.

Readings for each week's classes will be posted to Blackboard by the previous Friday. Reading reactions will be required in the weekly journal entries. Those reactions are intended to spark discussion from the readings that will be continued during some classes. Please complete readings and reactions on-time and be prepared for classroom discussion.

Guest Speakers:

If logistics allow, we will take one or two field trips to conduct class in a commercial orchard. Please provide these growers, who are donating their time during a busy harvest season, respect by arriving on-time and maintaining attention.

Tentative Course Schedule (may change based on instructor or University needs)

Week	Module	Learning Objective	Evidence of Student Learning (What does student mastery look like?)	Content that Supports Achieving LO (In addition to weekly lecture)	Assignment(s) or Assessment(s)	Feedback to Students
8/31 – 9/6	Week 1: Ripening and Harvest	1. Illustrate knowledge of key components of fruit ripening processes; 2. Identify fruit ripeness and characteristics for readiness to harvest; 3. Employ USDA standards to field-sort fruit for market.	1. Harvest completed efficiently (10 bu/hr) and within size / color standards. 2. CSA shares packed to meet commercial size, quality, handling standards.	1. On-farm packing demonstration 2. On-farm harvest demonstration 3. Readings: • Crassweller, "Apple maturity indices" • Blanpied & Silsby, "Predicting Harvest Date Windows for Apples; • USDA, "Grading Standards for Apples"	1. Divide into CSA packing teams 2. Introduce weekly CSA assignment (rolling due date) 3. Journal: Fruit grading	1. Adjustment as-needed to balance student availability 2. CSA customer rating 3. Instructor feedback
9/7 - 13	Week 2: Botany and morphology of fruit trees	Recognize structures important to plant and cropping functions in fruit trees.	Ability to identify fruit tree structures.	1. Field walk 2. Readings: • Bramlage, "On the Origins of the Edible Apple) • Crassweller, "Flowering habits of tree fruit" • Luby: Apples, Chp. 1.	1. Discussion: Orchard observations 2. BB quiz	1. Peer feedback 2. Self-graded
9/14 - 20	Week 3: Tree fruit cultivars	1. Identify important characteristics of important apple cultivars; 2. Compare and contrast cultivars for particular purposes.	Explain important differences among apple cultivars and how that may dictate production & marketing	1. On-farm cultivar comparison: Honeycrisp vs McIntosh harvest 2. Readings: • Roper, "Apple cultivars"	1. Assignment: Cultivar paper 2. Discussion: Favorite cultivars	1. Instructor feedback on BB 2. Peer feedback on DB
9/21 - 27	Week 4: Site selection	Evaluate a particular land site for its potential for tree fruit production	1. List and explain why certain characteristics of a site are preferred for fruit production. 2. Analyze a sample site and identify pros and cons in establishing an orchard from a site selection perspective	1. Crassweller RCPSU reading 2. TB lecture 3. Farm walk	1. Assignment: Site rating 2. Discussion: Ideal fruit production areas	1. Instructor feedback 2. Peer feedback on DB

9/28 – 10/4	Week 5: Planting and training systems	1. Compare intensive and extensive orchard planting systems 2. Argue merits of each from a grower and a larger industry perspective.	1. Identify the interaction between orchard training system intensity (i.e., low-density vs high-density) and crop yield, quality, and harvest labor. 2. Consider other orchard establishment and management characteristics that could affect system productivity, efficiency, and resiliency.	1. TB "Orchard training systems" lecture. 2. Robinson, T. (2004). Recent advances and future directions in orchard planting systems. Acta Hort, 732, 367-381. 3. Robinson, T. L. (2007). Common mistakes in planting and establishing high-density apple orchards. New York Fruit Quarterly, 15(4), 1-7. 4. High-density not a cure-all for Quebec orchard. Fruit Growers News, 9/12/2012.	1. In-field harvest exercise (group work). 2. Assignment: Crop yield measurement and assessment of training systems (individual) 3. Discussion: Orchard training / management systems.	1. Real-time group feedback 2. Instructor feedback: rubric & narrative. 3. Peer feedback on DB.
10/5 – 11	Week 6: Rootstocks	Explain important characteristics of commercially popular apple rootstocks;	1. Explain differences in fruit production attributable to rootstock. 2. Identify important rootstock characteristics and include examples of commercially-important genotypes. 3. Demonstrate ability to collect and process quantitiative research data.	1. NC-140 rootstock trial data collection 2. Readings: • Hoover, E. "How Rootstocks Influence Apple Trees" • Roper, T. "Rootstocks for Fruit Trees in Wisconsin"	1. NC-140 harvest & data collection (group project) 2. Assignment: NC-140 rootstock summary (individual) 3. Discussion: data collection and	1. Real-time intra-group dynamic) 2. Instructor feedback (rubric & text) 3. Peer feedback on Discussion Board.
10/12 – 18	Week 7: Land Preparation and Tree Planting	Propose a site remediation / preparation plan and initial planting plan for establishing an orchard at a particular location. FIELD TRIP??	Propose a site remediation / preparation plan and initial planting plan for establishing an orchard at a particular location.	1. Readings: • Fuller, "Orchard Site Preparation" • Bradshaw, "Site Selection and Preparation in Vermont Apple Orchards" • UVM Apple Team, "Pictorial Guide to Planting an Orchard" • Crassweller, "Laying Out an Orchard…" 2. Video: • Preparing to Plant a High Density Orchard	1. Assignment: Site remediation	1. Instructor feedback: rubric and comments

10/19 – 25	Week 8: Orchard nutrition and crop load management	1. Determine an orchard nutrition maintenance plan based on soil and foliar nutrient analyses. 2. Recognize crop thinning strategies appropriate to particular conditions. FIELD TRIP??	1. List appropriate types and calculate amounts of amendments to apply in an orchard. 2. Describe a specific thinning strategy given a set of orchard and crop load conditions.	1. Readings: • Stiles & Reid, "Orchard Nutrition Management" • Bradshaw, "Crop Load Management in Vermont Apple Orchards" • Roper, "Plant Growth Regulator Use in Apples" •	1. Assignment: Orchard nutrition and crop load plan 2. Discussion: Nature vs. nurture	1. Instructor feedback: rubric and comments 2. Peer feedback on Discussion Board.
10/26 – 11/1	Week 9: Pest management	Identify key pests of concern for successful tree fruit production; propose an annual pest management plan for your orchard.	1. Recall of the key, critical pests of orchard crops in the northeast. 2.	1. Resource: New England Tree Fruit Management Guide (the 2015-2016 guide is better in some ways) 2. Readings: • MSUE, "Fruit Crop Ecology. Ch 2: Managing the community of pests and beneficials" • Agnello, et al. "Comparative Programs for Arthropod, Disease and Weed Management in New York Organic Apples" • Elliot & Mumford. "Organic, integrated and conventional apple production: why not consider the middle ground?"	1. Pest fact sheet assignment 2. Pest ID quiz 3. Pest management section of farm plan	1. Instructor feedback: rubric and comments 2. Self-graded on BB 3. See Week 15
11/2 – 8	Week 10: Marketing, US & VT Orchard History	1. Consider important characteristics of wholesale, DSD, PYO, and similar market channels; 2. Develop marketing plan for your orchard. 3. Recognize important components of US & VT orchard history	1. Differentiate between important characteristics and considerations for marketing orchard crops based on markets, site, cultivar, system, location, etc. 2. Discuss the furutre of VT orchard industry	Readings: • Dunn, et al. "Fruit and vegetable marketing for small and part-time growers" • Smith, "Sample Orchard Business Plan" • UVM Extension "Develop a Pick-Your-Own Business" Resource: • Penn State Orchard Production Budgets (XLS) • Wilson, R. & Hamilton, J. "Cutting Through The Noise: Successful Marketing Campaigns That Reach Consumers"	Discussion (by Group): Marketing considerations for your final orchard plan	Peer feedback on Discussion Board.

11/9 – 15	Week 11: Orchard spraying	Understand the physical and safety requirements for applying spray materials to an orchard canopy.	Calculate tree row volume and application rates for an orchard.	Readings: • 2015-16 NETFMG "Sprayer Information" • Bradshaw, T. Sprayer Calibration. Video: • The Airblast Sprayer Calibration Process	Assignment: Sprayer Calibration Exercise	Instructor feedback: rubric and comments
11/16 – 22	Week 12: Orchard pruning	Demonstrate horticultural concepts while pruning trees in both intensive and extensive systems.	Prune one each of semidwarf / FSCL and dwarf / TS tree using appropriate cuts and horticultural concepts.	Reading: • Lord, W. & J. Anderson. Pruning Fruit Trees in the Home Orchard Video • Across the Fence: Pruning Apple Trees	In-orchard pruning activity.	Real-time instructor and peer feedback.
11/23 - 29	Week 13: Thanksgiving	Pause for a moment. Be thankful for what we have, and think of others who may not. Eat well. Share if you can. Ask for help if you need to.		Friends, family.	Eat. Rest. Visit. Recharge.	You are why I do this job, so please, keep inspiring me.

11/30 – 12/6	Week 14: Cider production	Consider fruit production for cider making, including cultivar, system, labor, and overall economics.	1. Recognize unique needs and considerations of cider apple production. 2. Calculate rates of return for cider apple vs dessert apple production	Readings: • Brennan, A. "UnGrowing Apples" • Farris, et al. " Assessing the Economic Feasibility of Growing Specialized Apple Cultivars for Sale to Commercial Hard Cider Producers" • Becot, F.A., et al. "Growing apples for the cider industry in the U.S. Northern Climate of Vermont: Does the math add up?" • Becot, F.A. et al. "Apple Market Optimization and Expansion through Value-Added Hard Cider Production. • Frochtzwajg, J. America's Hard Cider Boom Has One Problem: Not Enough Apples • Bradshaw, T. A Moving Target: Growers seek best way to supply fruit to the cidery market • Merwin, I. A. "Growing apples for craft ciders."	Discussion: Considerations for producing cider apples profitably	Peer feedback on Discussion Board.
12/7 - 11	Week 15: Exam week: Farm plans and student presentations	Synthesize farm management considerations into an overall management plan; demonstrate ability to work within groups to create a comprehensive written and public presentation.	1. Turn in a written, comprehensive farm plan developed by your group. 2. Present your plan in a 15-minute pitch to the class.	Everything from this semester, plus your own resources are fair game.	1. Written plan (see Assignment), due December 11 2. Oral /visual presentation on MS Teams, Dec 9	1. Peer review of farm plan 2. Instructor feedback: rubric and comments

Blackboard and other electronic communications:

UVM Blackboard is the primary tool for course management and all assignments must be submitted and will be grade via that system. In the event of a Blackboard outage, alternative electronic means for submitting assignments will be presented. If assignments are accepted via email, and announcement will be made prior to submission which will include specific instructions for tagging subject lines in order to track assignments. Assignments should not be turned in as paper copies unless otherwise stated. *Assignments will not be accepted via cloud services such as Google Docs. Please read that again.*

Students are expected to pay attention in class and to not use electronic communications for non-course purposes. However, we are well-into the 21st century and computers and phones are critically important methods for acquiring and sharing information. I may poll the class during meetings to provide input on certain topics, so the ability to contribute in real-time will be valuable. Feel free to bring your laptops and phones to use for these purposes. Cell phones should always be muted in class, and thumbs should not be idly scrolling screens.

Attendance Policy and Classroom Environment Expectations:

This course meets only one day per week, so any absence can result in a full week of missing class. Students are expected to attend and participate in class discussion. Students are specifically expected to attend, arrive on time, and show respect for guest speakers who are often volunteering their time. Tardiness and absences will affect the professionalism component of your grade.

1. If you are ill and missing only one day of classes, you can contact class professors by phone or e-mail directly and leave a clear message including your name, and that you are ill and will be missing the class.
2. If you are ill for 2 or more classes or experiencing a personal problem that will cause you to miss more than a day of classes, you must contact Whitney Northrop in the CALS Student Services Office or Student Services in your college. She will notify the instructors for you, but you will also need to work with your instructors to discuss his/her expectations in reference to your absence.
3. It is important that you as the student (not your advisor and not your parent) contact Student Services directly if at all possible. By doing so, we will have a very clear understanding of the nature of the illness or problem and how we can best help you.

Grading Criteria/Policies:

- All grading will be completed on Blackboard. Grading rubrics for assignments will be available and viewable.
- Late assignments: As an iterative and reflection-driven course, it is important to keep up with the assignments. Assignments will automatically be deducted 10% of the total grade for each day late. No assignments will be accepted after five days unless the absence has been approved by CALS Student Services. *Please read that again*.
- This course uses the standard Blackboard grading schema to convert numeric to letter grades. Numeric grades are not rounded to the next highest integer: an 89.9 is not a 90.

GRADING SCHEMA USED FOR THIS COURSE

	minus (−)		plus(+)
A	90-93.$\overline{9}$	94-96.$\overline{9}$	97-100
B	80-83.$\overline{9}$	84-86.$\overline{9}$	87-89.$\overline{9}$
C	70-73.$\overline{9}$	74-76.$\overline{9}$	77-79.$\overline{9}$
D	60-63.$\overline{9}$	64-66.$\overline{9}$	67-69.$\overline{9}$
F		<60	

- *Special requirements for Graduate Students taking the course:*
  This is a 200-level course, and as such, it is aimed primarily toward upper-level undergraduate students and is designed to focus on and assess integration and presentation of knowledge and concepts. It is, however, also approved for graduate credit without a separate section. Students who are taking this course for graduate credit must inform me of such designation the first week of class. Graduate student assignments and activities are the same as for undergraduates, but the word length, citation expectations, and general rigor is expected to be greater. I will publish a separate addendum within each assignment that includes extra effort required for graduate credit. For example, graduate student journal; entries are expected to be 500-800 words in length, and should reference at least one outside

source of information for context.
There will be no 'D' grades given to graduate students, the minimum passing grade for them is 70.

- As a rule, I do not negotiate with students over minor grade corrections on assignments. For every student who feels they received a subjectively low grade on an assignment, there are multiple students who likely received a subjectively high grade. If you feel like there was an egregious grading error on any given assignment, by all means discuss it with me, but it is highly unlikely that the grade will change unless a strong and compelling case is made. In my experience after assigning hundreds of course grades, any student can achieve a high grade in my courses by simply staying up on readings, attending and participating in class, and completing assignments on-time and according to the instructions.
- If you would like to contest a grade, please follow the procedures outlined in this policy: https://www.uvm.edu/policies/student/gradeappeals.pdf.
- For information on grading and GPA calculation, go to https://www.uvm.edu/registrar/grades.

Assessments (Graded Work):

Project, 25%:
Students will collaboratively develop and present a farm management plan for a commercial fruit farm. This is a summative assignment in lieu of an exam.

Field Practicals and Homework, 25%:
Applied, hands-on activities will be performed in orchards to develop skills introduced in classroom lectures. Students will be assessed on: pruning, canopy management; cropload assessment and adjustment; fertility plan development based on soil and plant tissue analysis; and presentation of key pests of orchard and vineyard plantings and methods for their management.

CSA share packing, 10%:
Each student will participate in grading, packing, and writing the weekly newsletter for the Catamount Educational Farm Apple CSA shares.

Quizzes, 25%:
Short quizzes will be assigned on Blackboard to cover material for a particular period.

Professionalism, 15%:
Students are expected to attend all classes, participate in activities, and be engaged in a professional manner.

Course Evaluation:

Students are expected to complete an evaluation of the course at its conclusion. Evaluations will be anonymous and confidential, and that the information gained, including constructive criticisms, will be used to improve the course.

Student Learning Accommodations:

The primary goal for this course is for students to achieve learning objectives, not to meet deadlines and complete assignments. That said, the framework provided by the coursework and due dates is important to help us achieve that goal. It is important for students to complete readings and assignments on-time and to be prepared for class discussions. However, I understand that not every student learns the same way, and we all come into this course with other responsibilities that don't go away when we walk through the classroom door. If a short-term accommodation or adjustment to an assignment or deadline will improve your success in this course, by all means please speak to me about it. *This does not mean that I will reward laziness. Flexibility is not a replacement for you completing the coursework and maintaining the trajectory of the course.*

If you have a more substantial need than a minor adjustment to course requirements, and in keeping with University policy, any student with a documented disability interested in utilizing accommodations should contact SAS, the office of Disability Services on campus. SAS works with students and faculty in an interactive process to explore reasonable and appropriate accommodations, which are communicated to faculty in an accommodation letter. All students are strongly encouraged

to meet with their faculty to discuss the accommodations they plan to use in each course. A student's accommodation letter lists those accommodations that will not be implemented until the student meets with their faculty to create a plan.
Contact SAS:
A170 Living/Learning Center
802-656-7753;
access@uvm.edu
www.uvm.edu/access

Religious Holidays:
Students have the right to practice the religion of their choice. If you need to miss class to observe a religious holiday, please submit the dates of your absence to me in writing by the end of the second full week of classes. You will be permitted to make up work within a mutually agreed-upon time. https://www.uvm.edu/registrar/religious-holidays

Academic Integrity:
The policy addresses plagiarism, fabrication, collusion, and cheating.
https://www.uvm.edu/policies/student/acadintegrity.pdf

Code of Student Conduct:
http://www.uvm.edu/policies/student/studentcode.pdf

FERPA Rights Disclosure:
The purpose of this policy is to communicate the rights of students regarding access to, and privacy of their student educational records as provided for in the Family Educational Rights and Privacy Act (FERPA) of 1974.
http://catalogue.uvm.edu/undergraduate/academicinfo/ferparightsdisclosure/

Promoting Health & Safety:
The University of Vermont's number one priority is to support a healthy and safe community. Resources that may be helpful include:

- UVM CALS Student Services
  https://www.uvm.edu/cals/student-services

- Center for Health and Wellbeing:
  https://www.uvm.edu/health

- Counseling & Psychiatry Services (CAPS)
  https://www.uvm.edu/health/CAPS
  Phone: (802) 656-3340

- C.A.R.E.
  If you are concerned about a UVM community member or are concerned about a specific event, we encourage you to contact the Dean of Students Office (802-656-3380). If you would like to remain anonymous, you can report your concerns online by visiting the Dean of Students website at https://www.uvm.edu/studentaffairs