

Weed Science and Management

11:776:306 (3 credits)

Fall Semester (yearly)

CONTACT INFORMATION

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COURSE DESCRIPTION

This is a senior level course that, in three modules, examines the impact of weeds in agricultural, turfgrass, and ornamental landscapes and the management options. Agricultural areas include food crop production systems (corn, soybeans, vegetables, fruit trees, and small fruits); turfgrass including golf courses, athletic fields, and lawns and other urban and suburban landscapes; ornamental landscapes including nurseries (field and container) and non-turfgrass areas in a landscape; and aquatic sites.

Module 1 covers the basic principles of weed ecology and management as well as their ecological and economic impact; Module 2 focuses on the different strategies for weed control; and Module 3 discusses weed management strategies for selected major weed situations in turfgrass, ornamentals, or production agriculture, highlighting advantages and disadvantages.

This is a lecture and laboratory course. Assigned reading should be completed before lecture or laboratory to gain some understanding of the material to be discussed in further detail. Class is highly interactive, and critical thinking is expected. Guest lecturers may be invited to participate. PowerPoint presentations will often accompany lectures to facilitate learning and understanding. Lab sessions will be tied as much as possible to lecture topics, and students are required to submit lab reports at the end of each session.

Students will participate in field trips to various landscape types (turf, ornamentals, nurseries, vegetable gardens, orchards, field crops, etc.) where they can observe how weed species interact with desirable plants in these settings and identify weeds first-hand. In the laboratory, greenhouse, or field, students will use the web tool *iNaturalist* (iNaturalist.org) to upload and identify photos of weeds in their natural environment. Other laboratory exercises are designed to demonstrate different methods of weed control and field sprayer/spreader calibration.

COURSE WEBSITE, RESOURCES AND MATERIALS

- Course website: Sakai

- Required textbook: Fundamental of Weed Science, 4th Edition (2013), R.L. Zimdahl, Academic Press, Inc. 664 pp. Also available in digital format.
- Optional Textbook: Weed Control in Turf Grass and Ornamentals, 1st Edition (2008), A.J. Turgeon, L.B. McCarty and N.E. Christians, Prentice Hall. 312 pp

Supplemental materials that support laboratory and weed identification activities will be provided as needed or placed on reserve at Chang Library. These include:

- Weeds of the Northeast (1997), R.H. Uva, J.C. Neal, J.M. Ditomaso, and A.F. Seneca, Cornell University Press. 397 pp
- Wild Urban Plants of the Northeast: A Field Guide (2010), P. Del Tredici, Cornell University Press. 374 pp
- Weeds: A Golden Guide® from St. Martin's Press (1987), A.C. Martin, St. Martin's Press. 160 pp. (pocket size book)

PREREQUISITE

11:776:242 Plant Science or one semester biology (01:119:115 or equivalent)

COURSE LEARNING GOALS

(Link to Plant Biology Undergraduate Program Goals: <http://plantbiology.rutgers.edu/undergrad/plantbiology/>)

By the end of this course, the student will be able to:

1. Identify weed species and describe their characteristics (addresses program goal 1)
2. Develop weed management programs for common weeds in both urban landscape and agricultural crop settings (addresses program goals 1 and 3)
3. Describe future challenges facing weed management, including but not limited to social expectations, herbicide resistance, and economics (addresses program goal 2)

ASSIGNMENTS/RESPONSIBILITIES AND ASSESSMENT

Grading

Mid-term exams (end of modules 1 and 2)	20%
Final exam (comprehensive)	20%
Quizzes	20%
Attendance and class participation (including in-class presentations)	10%
Weed identification	10%
Lab reports	20%

Grades will be classified based on Rutgers approved system: A, B+, B, C+, C, D, and F.

Learning goals assessment: Specific questions on exams and quizzes, targeted laboratory exercises, and in-class presentations will be used to assess student knowledge of course learning goals. In graded laboratory exercises, students will demonstrate their ability to identify, preserve, and catalog common weed species found in different landscape settings (course learning goal 1). In quizzes, exams, and in-class presentations, students will communicate their understanding of the complex social, economic, and biological context of weed management in current and future agricultural practice (course learning goals 2 and 3). The percentage score on these assessments will determine the level of mastery: >90% outstanding; 80-89% good; 70-70% satisfactory; <69% unsatisfactory.

ABSENCE POLICY

Class participation is essential in this course: students are expected to attend all classes; attendance and class participation constitutes 10% of final grade. Students who expect to miss class may contact the instructor via e-mail prior to the missed class or may use the University absence reporting website (<https://sims.rutgers.edu/ssra/>) to indicate the date and reason for the absence. An e-mail is automatically sent to the instructor.

COURSE SCHEDULE

Module 1: Understanding Weeds

- Week 1
 - Lecture 1: Course introduction, weed definition, and significance. Noxious and invasive weed species. What makes a plant a weed?
 - Reading for laboratory: Zimdahl pages 1-17; 20-23; 25; 28-39; some graphs from CS 414 section 1
 - Lab: Discuss iNaturalist. Weed walk around Foran to identify weeds. Morphological features common to all weeds will be discussed.
- Week 2
 - Reading: Zimdahl pages 43-55
 - Lecture 2: Discuss weed identification and why understanding life cycle and classification matters.
 - Lab: Visit Rutgers Horticultural Research Farms I and II to identify weeds, observe them in various settings, and use iNaturalist. Collect and identify weed seeds.
- Week 3
 - Reading: Zimdahl pages 75-96; 105-108
 - Lecture 3: Weed reproduction, dispersal, and germination.
 - Lab: Observe and dissect various weed vegetative parts under dissecting scope. Plant various weed/crop/nutrient combinations in the greenhouse for competition experiment
- Week 4
 - Reading: Zimdahl pages 113-122; 133-147; 152-157
 - Lecture 4: Weed ecology and interferences with crops.
 - Reading for Lab: Extension factsheet for sprayer and spreader calibration
 - Lab: Sprayer/Spreader: example of equipment, calibration, practical demonstration at Horticulture Research Farm II.
- Week 5
 - Reading: Zimdahl pages 191-222
 - Lecture 5: Introduction to invasive and noxious weeds; discuss case studies.
 - Lab: Using the same weed as in crop competition studies, each group will be assigned a problematic weed and will use lab time to research and present a summary of its identification, reproductive methods, and ecology in a specific system (e.g. corn field, cranberry bed, turfgrass, container nursery).
- Week 6
 - *Lecture: Exam 1*
 - Lab: Collect data on weed/crop competition studies and present findings to the class.

Module 2: Tools for Weed Management

- Week 7
 - Reading: Zimdahl pages 247-249; 257-261; 268-280; 287-297
 - Lecture 6: Overview of weed control methods: prevention, mechanical control, cultural practices, biological control, and chemical control.
 - Lab: Analysis and interpretation of herbicide label.
- Week 8
 - Reading: Zimdahl pages 419-451
 - Lecture 7: Herbicide chemistry and modes of action.
 - Lab: Student groups provided literature and online resources to research an herbicide MOA and present it to the class. Students observe weeds treated with different MOAs.
- Week 9
 - Reading: Zimdahl pages 375-398; 401-418
 - Lecture 8: Herbicide behavior in soil and plants.
 - Lab: Sprayer/Spreader Calibration: general theory and exercises in lab.

- Week 10
- Reading: Zimdahl pages 461-473
 - Lecture 9: Herbicide resistance: origin, mechanisms and management.
 - Lab: Spraying equipment (nozzles, pump, agitation), emerging technologies.
- Week 11
- Reading Zimdahl pages 316-320; 323-343; 495-506
 - Lecture 10: Organic weed control; societal aspects of weed management.
 - Lab: Presentation and discussion of alternative weed control techniques based on published papers.
- Week 12
- *Lecture: Exam 2*
 - *Thanksgiving recess*

Module 3: Developing Weed Management Programs

- Week 13
- Reading: Zimdahl pages 544-552
 - Lecture 11: Weed control programs in row crops (Guest Lecture)
 - Lab: Herbicide resistance: presentation of the International Survey of Herbicide Resistant Weeds website – Case study.
- Week 14
- Reading: Zimdahl pages 557-563
 - Lecture 12: Weed control programs in specialty crops, ornamentals, and aquatic sites.
 - Lab: Continue weed control programs lecture, wrap up and review for final.
- Week 15
- Reading: Zimdahl pages 552-558; supplementary materials
 - Lecture 13: Weed control programs in turfgrass, pastures, and rangeland.
 - Lab: Continue weed control programs lecture, wrap up with interactive quiz.

Final Exam (comprehensive, date to be determined)

FINAL EXAM/PAPER DATE AND TIME

The final exam is comprehensive and constitutes 20% of the total grade.

The Online Final exam Schedule: <http://finalexams.rutgers.edu/>

ACCOMODATIONS FOR STUDENTS WITH DISABILITIES

Please follow the procedures outlined at <https://ods.rutgers.edu/students/registration-form>. Full policies and procedures are at <https://ods.rutgers.edu/>

ACADEMIC INTEGRITY

The university's policy on Academic Integrity is available at <http://academicintegrity.rutgers.edu>

The principles of academic integrity require that a student:

- Properly acknowledge and cite all use of the ideas, results, or words of others.
- Properly acknowledge all contributors to a given piece of work.
- Make sure that all work submitted as his or her own in a course or other academic activity is produced without the aid of impermissible materials or impermissible collaboration.
- Obtain all data or results by ethical means and report them accurately without suppressing any results inconsistent with his or her interpretation or conclusions.

- Treat all other students in an ethical manner, respecting their integrity and right to pursue their educational goals without interference. This requires that a student neither facilitate academic dishonesty by others nor obstruct their academic progress.
- Uphold the canons of the ethical or professional code of the profession for which he or she is preparing.

Adherence to these principles is necessary in order to ensure that:

- Everyone is given proper credit for his or her ideas, words, results, and other scholarly accomplishments.
- All student work is fairly evaluated and no student has an inappropriate advantage over others.
- The academic and ethical development of all students is fostered.
- The reputation of the University for integrity in its teaching, research, and scholarship is maintained and enhanced.

Failure to uphold these principles of academic integrity threatens both the reputation of the University and the value of the degrees awarded to its students. Every member of the University community therefore bears a responsibility for ensuring that the highest standards of academic integrity are upheld.

STUDENT WELLNESS SERVICES

Just In Case Web App <http://codu.co/cee05e>

Access helpful mental health information and resources for yourself or a friend in a mental health crisis on your smartphone or tablet and easily contact CAPS or RUPD.

Counseling, ADAP & Psychiatric Services (CAPS)

(848) 932-7884 / 17 Senior Street, New Brunswick, NJ 08901 / www.rhscaps.rutgers.edu/

CAPS is a University mental health support service that includes counseling, alcohol and other drug assistance, and psychiatric services staffed by a team of professional within Rutgers Health services to support students' efforts to succeed at Rutgers University. CAPS offers a variety of services that include: individual therapy, group therapy and workshops, crisis intervention, referral to specialists in the community and consultation and collaboration with campus partners.

Violence Prevention & Victim Assistance (VPVA)

(848) 932-1181 / 3 Bartlett Street, New Brunswick, NJ 08901 / www.vpva.rutgers.edu/

The Office for Violence Prevention and Victim Assistance provides confidential crisis intervention, counseling and advocacy for victims of sexual and relationship violence and stalking to students, staff and faculty. To reach staff during office hours when the university is open or to reach an advocate after hours, call 848-932-1181.

Disability Services

(848) 445-6800 / Lucy Stone Hall, Suite A145, Livingston Campus, 54 Joyce Kilmer Avenue, Piscataway, NJ 08854 / <https://ods.rutgers.edu/>

Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: <https://ods.rutgers.edu/students/documentation-guidelines>. If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you with a Letter of Accommodations. Please share this letter with your instructors and discuss the accommodations with them as early in

your courses as possible. To begin this process, please complete the Registration form on the ODS web site at:
<https://ods.rutgers.edu/students/registration-form>.

Scarlet Listeners

(732) 247-5555 / <http://www.scarletlisteners.com/>

Free and confidential peer counseling and referral hotline, providing a comforting and supportive safe space.