**Contaminants in Agricultural Systems**

**ABE 4392 Sections 25972 & 25985**

***Class Periods (In Person & Online):*** Tuesday & Thursday, Period 4, 10:40–11:55 AM

***Location:*** 283 Frazier-Rogers Hall

***Academic Term:*** Fall 2025

***Instructor:***

Dr. Dengjun Wang

Department of Agricultural and Biological Engineering

University of Florida

1741 Museum Road, Gainesville, FL 32603

Faculty Profile: https://abe.ufl.edu/people/faculty/dengjun-wang/

**Email: dengjun.wang@ufl.edu**

Phone: (352) 294-7969

Office Location: 255 Frazier-Rogers Hall

Office Hours: Immediately after class and by appointment, in person or via ZOOM

***Teaching Assistant/Peer Mentor/Supervised Teaching Student:***

TBA. Teaching assistant (TA) will announce office hours (office location and ZOOM link) at the beginning of the course. Please contact TA in Canvas.

***Course Description: 3 Credits.***

This course explores the growing concerns of contaminants, including their sources, environmental behaviors, plant uptake, and strategies to mitigate their adverse effects in agricultural systems. These contaminants include pesticides, heavy metals, pharmaceuticals and personal care products, and new emerging contaminants such as **microplastics (MP)** and **per- and polyfluoroalkyl substances (PFAS)**. Students will learn how to use analytical instruments to analyzing contaminants in soil-water-plant system, assess their adverse impacts, develop best management practices for sustainable agriculture, and design engineering strategies for pollution control. This course is a combination of lectures, readings, group discussions, field trips and sampling, water treatment plant tour, laboratory experiments, analytical instrument operation, and data analysis, followed by a final project presentation.

***Course Pre-Requisites / Co-Requisites:***

None.

***Course Objectives:***

* Gain knowledge of the nature and sources of contaminants (from agrochemicals, biosolids, manures, water irrigation, runoff, etc.) in agricultural systems.
* Understand the fate, transport, and uptake of contaminants in soil-water-plant system.
* Equip analytical skills to identify and quantify contaminants in soil-water-plant system.
* Know adverse effects of contaminants on agricultural productivity, food safety, and human health.
* Develop best management practices and engineering strategies to mitigate adverse effects of contaminants in agricultural system.

***Materials and Supply Fees:***

None.

***Related to Program Outcomes (ABET):***

This course addresses the following ABET outcomes.

|  |  |
| --- | --- |
| **Outcome** | **Coverage** |
| 1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
 | Medium |
| 1. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
 | High |
| 1. An ability to communicate effectively with a range of audiences.
 | Medium |
| 1. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
 |  |
| 1. An ability to function effectively on a team whose members together provide leadership, create a collaborative environment, establish goals, plan tasks, and meet objectives.
 | Medium |
| 1. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
 | High |
| 1. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
 | Medium |

*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not a part of the course outcomes that are addressed.*

***Recommended Textbooks:***

* **Agriculture, Hydrology and Water Quality**

By: P. M. Haygarth and S. C. Jarvis.

Published on October 15, 2002, First Edition, CABI Publishing, 502 pages.

ISBN: 0-85199-545-4.

Link: https://www.cabidigitallibrary.org/doi/book/10.1079/9780851995458.0000.

* **Global Assessment of Soil Pollution: Summary for Policymakers**

By: Food and Agriculture Organization (FAO) and United Nations Environment Programme (UNEP).

Published in 2021, First Edition, FAO and UNEP, 84 pages.

ISBN: 978-92-5-134448-4.

DOI: https://doi.org/10.4060/cb4827en.

Link: https://openknowledge.fao.org/items/9f84ec0f-7280-4937-91f5-fa54bdd886a1.

* **Emerging Contaminants: Sustainable Agriculture and the Environment**

By: A. Kumari, V. D. Rajput, S. S. Mandzhieva, T. Minkina, E. D. van Hullebusch.

Published on March 26, 2024, First Edition, Elsevier.

ISBN: 978-0-443-18985-2.

DOI: https://doi.org/10.1016/C2022-0-00910-7.

Link: https://openknowledge.fao.org/items/9f84ec0f-7280-4937-91f5-fa54bdd886a1.

***Recommended Reading Materials:***

1. Clarke, B.O.; Smith, S. R. 2011. Review of ‘emerging’ organic contaminants in biosolids and assessment of international research priorities for the agricultural use of biosolids. ***Environment International,*** 37 (1): 226-247. <https://doi.org/10.1016/j.envint.2010.06.004>.
2. Pullagurala, V.L.R.; Rawat, S.; Adisa, I.O.; Hernandez-Viezcas, J.A.; Peralta-Videa, J.R.; Gardea-Torresdey, J.L. 2018. Plant uptake and translocation of contaminants of emerging concern in soil. ***Science of The Total Environment,*** 636: 1585-1596. <https://doi.org/10.1016/j.scitotenv.2018.04.375>.
3. Li, Z. 2025. Plant uptake models of pesticides: Advancing integrated pest management, food safety, and health risk assessment. ***Reviews of Environmental Contamination and Toxicology,*** 263: 3. <https://doi.org/10.1007/s44169-024-00076-y>.
4. Wang, W.; Ge, J.; Yu, X.; Li, H. 2020. Environmental fate and impacts of microplastics in soil ecosystems: Progress and perspective. ***Science of The Total Environment,*** 708: 134841. <https://doi.org/10.1016/j.scitotenv.2019.134841>.
5. Fu, Q.; Malchi, T.; Carter, L.J.; Li, H.; Gan, J.; Chefetz, B. 2019. Pharmaceutical and personal care products: From wastewater treatment into agro-food systems. ***Environmental Science & Technology,*** 53(24): 14083-14090. <https://pubs.acs.org/doi/full/10.1021/acs.est.9b06206>.
6. Li, X.; Shen, X.; Jiang, W.; Xi, Y.; Li, S. 2024. Comprehensive review of emerging contaminants: Detection technologies, environmental impact, and management strategies. ***Ecotoxicology and Environmental Safety,*** 278: 116420. <https://doi.org/10.1016/j.ecoenv.2024.116420>.
7. Saidon, N.B.; Szabo, R.; Budai, P.; Lehel, J. 2024. Trophic transfer and biomagnification potential of environmental contaminants (heavy metals) in aquatic ecosystems. ***Environmental Pollution,*** 340: 122815. <https://doi.org/10.1016/j.envpol.2023.122815>.
8. Chen, J.; Zhao, L.; Wang, B.; Blaney, L.; Huang, J.; He, X.; Wu, F.; Yu, G. 2025. Mitigating pesticide mixture hazard in global surface waters through agricultural management. ***One Earth,*** 8 (1): 101163. [https://www.cell.com/one-earth/abstract/S2590-3322(24)00593-1](https://www.cell.com/one-earth/abstract/S2590-3322%2824%2900593-1).
9. Hou, D.; O’Connor, D.; Igalavithana, A.D.; Alessi, D.S.; Luo, J.; Tsang, D.C.W.; Sparks, D.L.; Yamauchi, Y.; Rinklebe, J.; Ok, Y.S. 2020. Metal contamination and bioremediation of agricultural soils for food safety and sustainability. ***Nature Reviews Earth & Environment,*** 1: 366-381. <https://www.nature.com/articles/s43017-020-0061-y>.
10. Puri, M.; Gandhi, K.; Kumar, M.S. 2023. Emerging environmental contaminants: A global perspective on policies and regulations. ***Journal of Environmental Management,*** 332: 117344. <https://doi.org/10.1016/j.jenvman.2023.117344>.

***Required Computer:***

UF student computing requirement:<https://news.it.ufl.edu/education/student-computing-requirements-for-uf/>.

***Course Schedule:***

**Topic 1:** Introduction to contaminants

**Topic 2:** Sources of contaminants entering agricultural systems

**Topic 3:** Fate & transport of contaminants in the environment (**Lab Tour**)

**Topic 4:** Case study: Microplastics in agricultural systems (**First Exam**)

**Topic 5:** Plant uptake and food chain transfer of contaminants (**UF Field & Fork Tour**)

**Topic 6:** Analysis of contaminants in soil-water-plant system (**Field Sampling and Instrument Analysis**)

**Topic 7:** Contaminant residues in agricultural products

**Topic 8:** Effects of contaminants on agricultural productivity (**Mid-term Exam**)

**Topic 9:** Effects of contaminants on human health (**Guest Lecture**)

**Topic 10:** Case study 2: Per- and polyfluoroalkyl substances (PFAS) in agricultural systems

**Topic 11:** Best management practices for sustainable agriculture

**Topic 12:** Engineering strategies for pollution control (**Murphree Water Treatment Plant Tour**)

**Topic 13:** Policy and regulatory perspectives (**Final Project Presentation**)

***Important Dates (Tentative):***

**09/18/2025** First Exam (10:40 – 11:55 AM, 283 Frazier-Rogers Hall)

**10/14/2025** Mid-term Exam (10:40 – 11:55 AM, 283 Frazier-Rogers Hall)

**12/02/2025** Final Project Presentation

***Attendance Policy, Class Expectations, and Make-Up Policy:***

* **Attendance Policy:** Requirements for class attendance can be found here at UF Attendance Policies: <https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>. Please email Dr. Wang at dengjun.wang@ufl.edu, if you have any additional questions that are not covered by UF Attendance Policies, one day prior to the class.
* **Class Expectations:** The instructor will facilitate class discussions. Students are highly encouraged to participate in various class discussion activities by addressing questions, asking questions, and initiating group discussions during the class lecturing. Bonus points will be provided to simulate classroom discussions.
* **Make-Up Policy:** The student needs to email the instructor, Dr. Wang at dengjun.wang@ufl.edu, about the date of the make-up exam. Contents of the make-up exam will be changed to ensure a fair competition environment for all students.

***Evaluation of Grades:***

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| --- | --- | --- |
| **Assignment** | **Total Points** | **Percentage of Final Grade** |
| Homework sets (6) | 100 each | 18% |
| Video | 100 each | 6% |
| First Exam | 100 | 20% |
| Mid-term Exam | 100 | 20% |
| Project | 100 | 18% |
| Final Poster Presentation | 100 | 18% |
|  |  | **100%** |

**Video:** A 5-10 min video (PowerPoint presentation) needs to be submitted to Canvas, which is due in two weeks when the course starts. The topic of the video presentation should be related to one or more aspects (e.g., source, fate & transport, plant uptake, or food chain transfer; see ***Course Schedule*** above) of contaminants in agricultural systems. Students are highly recommended to select the most interested contaminants for the video presentation, so the instructor can pay more attention to these contaminants throughout the course lectures.

**Project:** The main purpose of the project assignment is to provide the unique opportunities for students to gain the hands-on experiences on how to: (1) collect soil, water, and plant samples in the field (e.g., UF Field & Fork); (2) process the field collected samples in the laboratory (soil grinding, water filtering, acid digestion, solid phase extraction, etc.); (3) analyze the concentrations of contaminants in the processed samples using analytical instruments (UV-vis spectrophotometer, ICP-OES, HPLC-MS/MS, etc.); and (4) analyze and interpret the collected data of contaminants in the soil-water-plant system. The project results will be presented as final project presentation. After the completion of the project assignment, students are expected to gain rich experiences on how to analyze and track contaminants in the soil-water-plant system, and basic knowledge on the healthy vs. contaminated soil-water-plant system.

All deliverables should be submitted electronically in Canvas. Electronic documents must be a single text document (i.e., Word or PDF file) that clearly address the assignments (e.g., homework). Any relevant graphs, tables, and equations that support your assignment should be included (i.e., pasted) in this document and should be numbered, labeled, and captioned appropriately. If you do not sufficiently explain your work, you may will get partial credit. You may, and probably should, attach additional material (i.e., well-organized and labeled spreadsheets or other calculations) in addition to the required text report. The assignments should be formatted so that they can be printed on standard paper (8.5’’ by 11’’).

***Grading Policy:***

|  |  |  |
| --- | --- | --- |
| **Percent**  | **Grade**  | **Grade Points**  |
| ≥ 90.0 | A  | 4.00  |
| 87.0 – 89.9  | A-  | 3.67  |
| 84.0 – 86.9  | B+  | 3.33  |
| 80.0 – 83.9  | B  | 3.00  |
| 77.0 – 79.9  | B-  | 2.67  |
| 74.0 – 76.9 | C+  | 2.33  |
| 70.0 – 73.9  | C  | 2.00  |
| 67.0 – 69.9  | C-  | 1.67  |
| 60.0 – 66.9  | D  |  |
| 0.00 – 59.9  | E  | 0.00  |

More information on UF grading policy may be found at:

[UF Graduate Catalog](https://catalog.ufl.edu/graduate/?catoid=10&navoid=2020#grades)

[Grades and Grading Policies](https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/)

***Students Requiring Accommodations:***

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/>. 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.

***Course Evaluation:***

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/>.

**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.

***University Honesty Policy:***

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 ([https://sccr.dso.ufl.edu/process/student-conduct-code/)](https://sccr.dso.ufl.edu/process/student-conduct-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. 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.

***Commitment to a Safe and Inclusive Learning Environment:***

The Herbert Wertheim College of Engineering values varied perspectives and lived experiences within our community and is committed to supporting the University’s core values, including the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of race, creed, color, religion, age, disability, sex, sexual orientation, gender identity and expression, marital status, national origin, political opinions or affiliations, genetic information, and veteran status.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

• Your academic advisor or Graduate Coordinator

• HWCOE Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu

• Pam Dickrell, Associate Dean of Student Affairs, 352-392-2177, pld@ufl.edu

• Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

***Software Use:***

All faculty, staff, and students at 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. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

***Student Privacy:***

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <https://registrar.ufl.edu/ferpa.html>.

***Campus Resources:***

*Health and Wellness:*

**U Matter, We Care:**

Your well-being is important to the University of Florida.  The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need.  If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress.  A nighttime and weekend crisis counselor is available by phone at 352-392-1575.  The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center.  Please remember that asking for help is a sign of strength.  In case of emergency, call 9-1-1.

**Counseling and Wellness Center:** [https://counseling.ufl.edu](https://counseling.ufl.edu/), and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

**Sexual Discrimination, Harassment, Assault, or Violence**

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the [**Office of Title IX Compliance**](https://titleix.ufl.edu/), located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

**Sexual Assault Recovery Services (SARS)**

Student Health Care Center, 392-1161.

**University Police Department**at392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

*Academic Resources:*

**E-learning technical suppor***t*, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. <https://elearning.ufl.edu/>.

**Career Connections Center**, Reitz Union, 392-1601. Career assistance and counseling; [https://career.ufl.edu](https://career.ufl.edu/).

**Library Support**, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

**Teaching Center**, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. <https://teachingcenter.ufl.edu/>.

**Writing Studio, 302 Tigert Hall***,* 846-1138. Help brainstorming, formatting, and writing papers. <https://writing.ufl.edu/writing-studio/>.

**Student Complaints Campus***:* <https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>;[https://care.dso.ufl.edu](https://care.dso.ufl.edu/).

**On-Line Students Complaints***:* [*https://distance.ufl.edu/getting-help/*](https://distance.ufl.edu/getting-help/)*;* [*https://distance.ufl.edu/state-authorization-status/#student-complaint*](https://distance.ufl.edu/state-authorization-status/#student-complaint)*.*