

## ENV6435

## Advanced Water Treatment Process Design

Spring 2022

**Course Description: (3 Credits)** Design of selected water treatment processes including disinfection (with a detailed discussion of hydrodynamic behavior of reactors), air stripping, adsorption, and membrane processes.

**Objective:** To provide students with learning experiences that will enable them to become proficient in designing water treatment processes—including disinfection, air stripping, adsorption, and membrane processes—that will improve the quality of drinking water for the benefit of society.

**Desired Outcomes:** Upon completion of this course students should:

- have an ability analyze and interpret data that will provide design parameters for selected water treatment processes.
- be proficient in the advanced principles and practice of selected water treatment processes.

**Assessment Methods:** The instructor will assess the extent to which the above objective and outcomes are achieved through the evaluation of written reports and exams.

**prerequisites:** ENV 4514C (Water and Wastewater Treatment) and EES 4201 (Water Chemistry) (or equivalent courses)

**text:** *Water Treatment Principles and Design*, Ed., JM Montgomery, 3<sup>rd</sup> Ed., 2017 (available on line through the UF library web site).

**Instructor:** Dr. Paul Chadik Room 210 Black Hall, pchadik@ufl.edu. When communicating with the instructor for this course, please use the Canvas mail system.

Office hours: Sunday 4:00 to 5:00 pm Via Zoom  
 Tuesday 4:00 to 5:00 pm Via Zoom  
 Wednesday 4:00 to 5:00 pm Via Zoom

The Zoom link will be posted on the Canvas course site.

**Teaching/Lab Assistant:** There is no TA assigned to this course.

**Meeting Room:** CSE E107

**Meeting times:** Tuesday, periods 5 - 6 (11:45 AM - 1:40 PM)  
 Thursday, period 6 (12:50 PM - 1:40 PM)

**Grading:** The grading will be based on the written reports and exams that the students complete and submit. Accuracy of design calculations, clarity and completeness of presentation and timeliness of submission will all be included in the evaluation. There will be four reports and four exams (see schedule at the end of this syllabus). The exams will be open book and open notes.

Each report will be worth 15 % of the final grade and each test will be worth 10% of the final grade. There will be no comprehensive final exam in this course.

**Grading Scale:**

Score	90.0 – 100	86.7 – 89.9	83.3 – 86.6	80 – 83.2	76.7 – 79.9	73.3 – 76.6	70.0 – 73.2	66.7 – 69.9	63.3 – 66.6	60.0 – 63.2	56.7 – 59.9	<56.7
Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E

More information on UF grading policy may be found at: <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

**Attendance:** This course is offered both in a face-to-face format and 100% online in an asynchronous manner. Students must either attend all classes or view all posted online videos, but they may view the videos at their own convenience.

**There is no requirement to attend the face-to-face class even though you are registered in that section. Indeed, during the surge that is expected in the spring of 2022, I encourage students not to attend the face-to-face class.**

Excused absences must be consistent with university policies in the Graduate Catalog

(<https://catalog.ufl.edu/graduate/regulations>) and require appropriate documentation. Additional information can be found here: <https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>

**Assignments:** Four design projects will be assigned during the semester. Each report will be broken up into two to three parts. These design reports will require spreadsheet calculations and these spreadsheets must be in Excel (2003 or later versions). These assignments must be completed in a professional manner. Students are expected to complete their own assignments including development of spreadsheets and calculations. Learning the science and design principles taught in this course is highly a function of working on and completing the assignments. These assignments account for 60% of the course grade. Only one workbook will be submitted for each assignment, although there may be many spreadsheets within that one workbook. Spreadsheets must clearly show how the design calculations are developed and how the answers were obtained.

**Canvas:** We will use the e-learning tool, Canvas, for this course. Notes consisting of PowerPoint slides to be used in class, homework assignments, this syllabus, and other information will be posted on the Canvas course site. Online information regarding common tools in Canvas are provided for students. This information is available via the *Student Intro to ELS* link at <http://lss.at.ufl.edu>. Students needing assistance with the computer and technical requirements for using E-learning, should seek this assistance from the UF HelpDesk (CSE Building, Room 520, 352-392-4357, [helpdesk@ufl.edu](mailto:helpdesk@ufl.edu)). The HelpDesk can also assist students who are having trouble logging into Canvas.

### ***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.bluer.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 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. 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 broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will

treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

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 Program Coordinator
- Jennifer Nappo, Director of Human Resources, 352-392-0904, [jpennacc@ufl.edu](mailto:jpennacc@ufl.edu)
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, [taylor@eng.ufl.edu](mailto:taylor@eng.ufl.edu)
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, [nishida@eng.ufl.edu](mailto:nishida@eng.ufl.edu)

### **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. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

In the membrane processes portion of the course, we will use free software from a membrane manufacturer.

Please note the university computer requirements: <https://it.ufl.edu/it-policies/student-computing-requirements/>

And the College of Engineering computer requirements at: <https://www.eng.ufl.edu/students/resources/computer-requirements/>

### **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](mailto: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>, 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](#), located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, [title-ix@ufl.edu](mailto:title-ix@ufl.edu)

#### **Sexual Assault Recovery Services (SARS)**

Student Health Care Center, 392-1161.

**University Police Department** at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

#### **COVID-19**

- You are expected to wear approved face coverings at all times during class and within buildings even if you are vaccinated.
- If you are sick, stay home and self-quarantine. Please visit the UF Health Screen, Test & Protect website about next steps, retake the questionnaire and schedule your test for no sooner than 24 hours after your symptoms began. Please call your primary care provider if you are ill and need immediate care or the UF Student Health Care Center at 352-392-1161 (or email [covid@shcc.ufl.edu](mailto:covid@shcc.ufl.edu)) to be evaluated for testing and to receive further instructions about returning to campus.
- If you are withheld from campus by the Department of Health through Screen, Test & Protect, you are not permitted to use any on campus facilities. Students attempting to attend campus activities when withheld from campus will be referred to the Dean of Students Office.

- UF Health Screen, Test & Protect offers guidance when you are sick, have been exposed to someone who has tested positive or have tested positive yourself. Visit the [UF Health Screen, Test & Protect website](#) for more information.
- Please continue to follow healthy habits, including best practices like frequent hand washing. Following these practices is our responsibility as Gators.

#### Academic Resources

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

**Career Resource Center**, Reitz Union, 392-1601. Career assistance and counseling; <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>.

**On-Line Students Complaints**: <http://www.distance.ufl.edu/student-complaint-process>.

<b>ENV6435 Advanced Water Treatment Process Design</b>		<b>Readings</b>	<b>Spring 2022</b>
<b>Date</b>	<b>Topic</b>		<b>Tests &amp; Reports Due</b>
1/6	Course Introduction & Introduction to Reactor Design	Chapter 6 MWH	
1/11	Residence Time Distributions	“	
1/13	Reactions in Ideal and Real Reactors	“	
1/18	Modeling Real Reactors	“	
1/20	Segregated Flow Model & SWTR	“	
1/25	Disinfection Modeling Partially Segregated Flow Model	“	
1/27	Review and Test Release		Due Jan. 31 11:59 pm
2/1	Air Stripping Intro & Henry's Law	Chapter 14 MWH	
2/3	Mass transfer – Whitman two-film model	“	
2/8	Mass transfer coefficients, Onda correlations and Packing	“	
2/10	PTA Analysis	“	
2/15	Eckert correlation & PTA Design	“	
2/17	Optimization	“	
2/22	Emission Control & Bubble Air Stripping	“	
2/24	Review and Test Release	“	Due 2/28 11:59 pm
3/1	Natural Organic Matter (NOM) and Disinfection Byproducts (DBPs) Adsorption Intro & AC properties		
3/3	Adsorptions Kinetics & Mass Transfer	Chapter 15 MWH	
3/8	Spring Break – No class	“	
3/10	Spring Break – No class	“	
3/15	Equilibrium Isotherms, Competitive Adsorption	“	
3/17	PAC Systems Design	“	
3/22	GAC systems design		
3/24	Review and Test Release		Due 3/28 11:59 pm
3/29	Membrane Types & Performance	Chapter 17 MWH	
3/31	Water & Solute Fluxes Recovery & Rejection	“	
4/5	Pretreatment, fouling, scaling	“	
4/7	Post Treatment & model introduction	“	
4/12	RO/NF models	“	
4/14	Concentrate disposal	“	
4/19	Review and Test release		Due 4/25 11:59 pm