

CES 6585 – Wind Engineering – Spring 2021

- Instructor:** David O. Prevatt, Ph.D. PE (MA), F.ASCE F.SEI Office: Weil Hall 475E
Professor of civil engineering (Structures) Phone: (352) 294-7798
Department of Civil and Coastal Engineering E-mail: dprev@ufl.edu
- Lectures:** Monday (M), 10:40 a.m. – 12:35 p.m., and Wednesday (W), 10:40 a.m. – 11:30 a.m. online
Monday: Weil 238 | Wednesday: Turlington 2322
- Office Hours:** Wednesday (W), 11:30 a.m. – 12:35 p.m., or by appointment
- Prerequisite:** CES 3102 (or equivalent undergraduate structural analysis)

- Text Books:** **Recommended: (available at UF Library)**
1. ASCE 7, "Minimum Design loads for Buildings and Other Structures," American Society of Civil Engineers, 2010/2016: <https://www.asce.org/asce-7/>
 2. [Holmes, J.D., Wind Loading of Structures, 3rd Edition, Taylor and Francis, 2015.](#)
 3. Simiu, E., & Scanlan, R. H. (1986). Wind effects on structures: an introduction to wind engineering. John Wiley.
 4. Advanced Structural Wind Engineering, 1st Edition, Yukio Tamura and Ashan Kareem, ISBN 978-4-431-54337-4
 5. Peer-reviewed journal articles on wind engineering available through the [George A. Smathers Libraries](#) or Google Scholar (must be on campus or logged into [UF VPN](#))
 - a) Journal of Wind Engineering and Industrial Aerodynamics <http://bit.ly/3q25MI0>
 - b) Journal of Structural Engineering
 - c) Others

Objectives: The primary objective is to introduce graduate students with interest in structures to wind engineering— which is a broad discipline spanning several fields and detailed research subjects. It provides the science of how naturally generated planetary winds affects structures, infrastructure and communities around us and the engineering decisions adopted to create safe communities. The course will marry structural engineering concepts and atmospheric science fundamentals. At its extreme, strong winds will cause damage, catastrophic failure, loss of life and injury to people, due to the wind itself debris blow about and sometimes by storm surge generated waves and flood. At low to moderate levels wind provides gentle cooling breeze within urban settings, a fluid for sports recreation and it has been a source of power for sailing ships thousands of years, windmills and wind turbines. Wind is a natural process at planetary scale that distributes heat from high temperature to low temperature areas and its movement is fundamental to the climates that we generally experience.

Our approach to wind engineering topics will be in the context of understanding the formation of extreme winds, estimating its strength, and developing models that predict the loads and wind load effects produced on buildings. While we will focus mainly on low-rise and high-rise buildings, including houses, schools, commercial and industrial buildings, wind also affects other types of structures such as bridges, transmission lines that are important to society. How strong winds are generated (e.g. in hurricanes, tornadoes, or thunderstorm downbursts) produces identifiable characteristics of wind behavior, strengths and its impact on a community in terms of the size or scale of damage. The damage though we observe is directly related to structural engineering and minimum construction standards that a community selects and enforces as acceptable.

The goal of the course is to provide students with a basic knowledge of the following:

- a) Wind engineering history and wind impacts on communities (forensic engineering)
- b) formation, probability of occurrence, and geographic distribution of extreme wind events,

- c) physics of extreme winds, and wind load effects on structures
- d) impacts of extreme winds from hurricanes and tornadoes on residential communities
- e) design wind loads for low-rise structures and their basis,
- f) structural response to wind loading, and
- g) Typical wind tunnel and full-scale structural testing of buildings and building components

Organization: The class will meet twice per week for lectures, in-depth discussions, assignments, & group activities. By the typical schedule, Mondays will consist of overview by instructor and student-led discussion of weekly readings and Wednesdays will consist of lectures and working on course assignments and projects. The instructor will provide guidance and show examples to assist the students as need with their assignments and final projects. Lectures and in-class group projects will be the primary mode of learning in the online classroom.

THIS IS A GRADUATE LEVEL COURSE AND IT IS EXPECTED STUDENTS HAVE SUFFICIENT MATURITY TO INDEPENDENTLY DELVE INTO RESEARCH, TO ASK QUESTIONS, TO DISCUSS AND SEEK TO CONSULT WITH INSTRUCTOR FREQUENTLY.

Evaluation: **Class Participation:** Class participation will be evaluated based on two components. The first is attendance which will count for 5% of the final grade. Students are expected to attend lecture periods and participate in discussions and group activities during the semester. Students may be excused from absences with appropriate documentation according to the university policy (more information provided in Section XIII below). The other 25% of class participation will be discussion of the weekly readings on Canvas and in class. Students will be required to post their own summaries and personal reflections on the papers and discuss the papers further during class periods. Graduate students will be evaluated using the rubric provided on pages 2-3 of the syllabus. Graduate students will be responsible for leading the in-class discussion at least once during the semester. A rubric for evaluation of discussion leaders is provided below.

Rubric for Evaluation: Online Readings Synthesis/Reflection

Task: Write a 300-500 word synthesis and personal reflection of the weekly assigned readings and submit it via Canvas prior to class. Consult the rubric below to make sure you include all required elements to receive full credit.

(Adapted from two sources: Solan & Linardopoulos 2011, http://jolt.merlot.org/vol7no4/linardopoulos_1211.htm; Reflection/Discussion Critique Rubric, <http://www.rcampus.com/rubricshowc.cfm?sp=yes&code=D97AAC&>.)

Evaluation Category	Standards for Excellent Work	Points	Instructor Comments
Summary of Key Concepts	-Demonstrate comprehension of key concepts from readings -Recognize & define key concepts in summary -Use terms & concepts appropriately in context	/5	
Evaluation & Synthesis of Key Concepts	-Construct generalized judgments and/or arguments about key concepts in readings -Support arguments using specific instances or examples from the readings	/6	

Evaluation Category	Standards for Excellent Work	Points	Instructor Comments
Critique Strategies	-Employ one or more critique strategies such as: <ul style="list-style-type: none"> ▪ Compare/contrast between readings ▪ Deconstruction of language or logic ▪ Identification of methodological shortcomings 	/6	
Personal Reflection	-Discuss what student learned and how their perspective changed -Identification of potential avenues for advancing research	/4	
Writing & Communication Proficiency	-Organize writing with clear structure: <ul style="list-style-type: none"> ▪ Introduction ▪ Body ▪ Conclusion -Avoid spelling, grammar, syntax, punctuation, or other writing errors	/4	

Assignments: Students will complete four assignments during this course, which in total will comprise 30% of the final grade. These assignments will engage students in four activities designed to build their understanding of wind engineering modeling, post-event damage assessments, extreme value statistics, wind velocity profiles and turbulence, calculation of pressure coefficients on bluff body models and design wind loads. The assignments must be completed individually by each student.

Final Project: **Final Project:** For the final project, students will choose a specific wind engineering topic and/or a significant wind-related natural hazard event and trace how wind engineering research developed to provide analytical and other tools and advanced our current knowledge in the field. The paper should include discussion of future-looking aspects of potential next generation research needed to be more impactful and benefiting our communities in the United States and beyond. Students will also research ways resilience and sustainability and equitable use of resources are being deployed (or not deployed). The final project paper should be about 3500 words in length and include citations, data tables, and maps and graphs as appropriate. The project will be worth 20% of the total grade. The majority of the points will be related to the paper which each student will write and turn in by April 23th. The remaining 5 percentage points will be for a 5-7-minute presentation given the last week of classes. More detailed instructions about the final project will be provided to students via Canvas and in class.

Exams: **Exams:** In total, the two exams will account for 20% of the final grade, 10% each for the Midterm and Final exams. The exams will consist of a mix of short answer questions, mathematical calculations and short essays.

Assignments and Exams	Percent of Final Grade
Reading Essays & Discussion	30%
Assignments	30%
Final Project Paper & Presentation	20%

Exam #1: Midterm	10%
Exam #2: Final (not cumulative)	10%

Grading Scale (%)	
92.5 – 100	A
89.5 – 92.4	A-
86.5 – 89.4	B+
82.5 – 86.4	B
79.5 – 82.4	B-
76.5 – 79.4	C+
72.5 – 76.4	C
69.5 – 72.5	C-
66.5 – 69.4	D+
62.5 – 66.4	D
59.5 – 62.4	D-
< 59.5	E

Communication: Communication outside of class hours will be directed through your official university account. This e-mail address is: **userid@ufl.edu**. If you are routinely using another account, you will have to check your official university account. **Canvas will be used to post class information such as the syllabus, assignments, class project, some handouts, and all grades.**

Attendance: Students are expected to attend class on a regular basis. Absences can be excused with proper documentation according to university policy. 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/ugrad/current/regulations/info/attendance.aspx>.

Late Work: All assignments submitted after their respective deadlines will be assessed a penalty: ten percentage points if one day late, fifteen percentage points for 2-3 days late, and 30 percentage points for 4-7 days late. Assignments will not be accepted if overdue by more than seven days.

Examination Policies and Reading Days: Course policies are consistent with University policies on during-term exams, final exams, reading days, and make-up exams. Students must notify the instructor as soon as possible in case of absence during an exam and provide documentation as to the reason for the absence. If deemed an excused absence, the student will be permitted a reasonable amount of time to make up the missed exam. More details can be found at <https://catalog.ufl.edu/UGRD/academic-regulations/examination-policies-reading-days/>.

Grade Dissemination: You can access your scores at any time using the Grade function in Canvas. The instructor will post grades within about one week of the due date of each assignment and the mid-term exam.

Grading Policies for Assigning Grade Points: Information on current UF grading policies for assigning grade points may be found at <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>.

Grades of "Incomplete": The current university policy concerning incomplete grades will be followed in this course. An incomplete grade may be assigned at the discretion of the instructor as an interim grade for a course in which you have completed a major portion of the course with a passing grade, been unable to complete course requirements before the end of the term because of extenuating circumstances, and obtained agreement from the instructor and

arranged for resolution of the incomplete grade. Instructors are not required to assign incomplete grades.

Course Outline: An approximate outline and schedule for the course is given below. These dates and topics are estimates and can be adjusted by the instructor to accommodate field trips, student progress, or additional topics of interest as needed.

CES 6585 Wind Engineering - Spring 2022		Class	Date	Holmes	Tamura
WEEK 1	Discussion and course details (about the 2- papers per week paper review and discussion in 2-h class Monday), StEER evaluating natural hazards damage	1	01/03/22		
		2	01/05/22		
WEEK 2	What is wind, wind storms and their characteristics, general principles, wind effects on things people and buildings structures (planes trains and automobiles)	3	01/10/22		
		4	01/12/22		
WEEK 3	(MLK Day Monday) Effect of wind on structures: the good, the bad the ugly: convection, sailing, wind mills & electricity from wind, hurricane and tornado damage, natural hazards, peak tomoado season - tale of two tomodoes 1970 and 1896	5	01/17/22		
		6	01/19/22		
WEEK 4	Minimum Wind Design Load standards -ASCE7-16 (MWFS)	7	01/24/22		
		8	01/26/22		
WEEK 5	Minimum Wind Design Load standards -ASCE7-16 (C&C)	9	01/31/22		
		10	02/02/22		
WEEK 6	Measuring of winds: the planetary scale, spectral gap, and at local scale, spatial and temporal variations of wind speed staionary winds , statistics, introduce wind tunnels	11	02/07/22		
		12	02/09/22		
WEEK 7	Boundary layer wind tunnels, and pressure coefficients, velocity scaling. Structural testing of building components and scaling	13	02/14/22		
		14	02/16/22		
WEEK 8	Midterm Exam (on Monday) measuring of wind loads: low rise buildings, tall buildings, slender objects, bluff body aerodynamics	15	02/21/22		
		16	02/23/22		
WEEK 9	measuring of wind loads: low rise buildings: bluff body aerodynamics	17	02/28/22		
		18	03/02/22		
WEEK 10	SPRING BREAK	19	03/07/22		
		20	03/09/22		
WEEK 11	Project Focus - Tomado-resilient design of residential structure	21	03/14/22		
		22	03/16/22		
WEEK 12	Measuring of winds: Turbulence, power spectrum then tomadoes thunderstorms, non-stationary wind events, EF-scale, statistics, tomoado simulator	23	03/21/22		
		24	03/23/22		
WEEK 13	Discussion on wind engineering and forensic engineering professions - insurance, building codes	25	03/28/22		
		26	03/30/22		
WEEK 14		27	04/04/22		
		28	04/06/22		
WEEK 15	Reports due	29	04/11/22		
		30	04/13/22		
WEEK 16	Project Presentations by Students		04/18/22		
			04/20/22		
FINAL EXAM WEEK	FINAL EXAM		04/28/22		3:00 - 5:00

- Standards of Engineering Work:** Due dates will be defined for each assignment. The solution to each assignment will be posted on Canvas after the due date. It is the responsibility of the student to compare their assignment to the official solution in a timely manner.
- Proper engineering units must be used at all times and the use of three significant figures is sufficient for design purposes. **Answers without proper units are incorrect.**
 - Your work must be neat and organized. Solution logic should be obvious and flow from beginning to end. It is expected that you will use engineering paper for written calculations.
 - Highly recommend using software (available in engineering computer labs or through [UF Apps](#)) for your assignments as appropriate:
 - **Mathcad Prime** for general assignments with numerical analysis
 - **MATLAB** for data analysis
 - Clearly state assumptions and cite relevant code provisions.
 - Use of a straightedge is required; engineering paper is recommended.
 - Clearly indicate the part or problem number on which you are working.
 - All assignments must have your name, assignment number and date indicated **on each page.**
 - All final answers must be clearly indicated.
 - Students are allowed to discuss homework problems with another, but individually worked solutions should be submitted. Homework copied from another student will not receive any credit. It is very important to understand the difference between working together and copying. See Academic Integrity (below).
 - Departures from these guidelines will result in deductions from your grades.

Important Dates:	Classes Start	=	Monday, January 5, 2022
	Drop/Add Ends	=	Friday, January 4 2022
	Martin Luther King, Jr Day	=	No Class Monday, January 17, 2022
	Last Day to Withdraw	=	
	Reading Days	=	Thurs-Fri, Apr 21 nd -22 nd 2022
	Final Project Due	=	Wednesday, April 11, 2022
	Final Exam Day	=	Thurs. April 28, 2022 3:00 PM – 5:00 PM

Instructor Evaluation: Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu/evals>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results/>.

Academic Course Policies: Technology and Media

Email: Each of you has a UF email address. It is vital that you maintain an active UF email account and that you **check it often**. This tentative syllabus is **subject to change**, and any changes will be transmitted to you via your UF email account and Canvas (see below). Students should email the instructor if they have questions about any of the lectures, readings, assignments, or exams. You should expect a response within about 24 hours during weekdays. On holidays or weekends, expect a response on the next business day. The instructor will reasonably expect similar time frames for responses to emails sent to students.

Canvas: Course materials such as lectures, readings, the syllabus, and assignment instructions will be available through Canvas (<https://elearning.ufl.edu>). You will also find all due dates and grades on Canvas. Students must activate their UF GatorLink account in order to use Canvas. If you need help learning how to perform various tasks related to this course or other courses that utilize Canvas, please consult the above webpage. You may also contact the UF Computing Help Desk at (352) 392-HELP (4357) or helpdesk@ufl.edu.

Online Course Evaluation: Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at gatorevals.aa.ufl.edu/. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at gatorevals.aa.ufl.edu/public-results/. Students are strongly encouraged to provide feedback DURING the semester as well in order that the instructor can eliminate barriers and maximize their learning.

Recordings and Notes: It is not permitted to sell notes or recordings from this class without written consent of the instructor. Nor are students permitted to disseminate recordings of the instructor lecturing or post copies of assignments or exams on the internet.

Zoom Presence and Recorded Sessions: Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

Disabilities: Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make any necessary arrangements. Students should present appropriate verification from the Disability Resource Center (DRC) during the instructor's office hours or by appointment. For additional information, you may contact the DRC office at 001 Reid Hall, 352-392-8565 or visit <http://disability.ufl.edu/>.

Counseling Services: Resources are available on campus for students having personal problems or lacking clear career and academic goals. The resources include:

- [UF Counseling & Wellness Center](#), 3190 Radio Rd, 352-392-1575, psychological, psychiatric, and counseling services.
- [Career Connections Center](#), Reitz Union, Suite 1300, 352-392-1601, career and job search services.