NEW COURSE PROPOSAL
Graduate Programs

FLORIDA ATLANTIC UNIVERSITY

Department Civil, Environmental & Geomatics Engineering

College Engineering and Computer Science
(To obtain a course number, contact erudolph@fau.edu)

UGPC Approval _____
UFS Approval _____
SCNS Submittal _____
Confirmed _____
Banner Posted _____
Catalog _____

Prefix CES **Number** 5528	*(L = Lab Course; C = Combined Lecture/Lab; add if appropriate)* **Lab Code**	**Type of Course** Lecture	**Course Title** Advanced Building Design

Credits *(Review Provost Memorandum)*
3

Effective Date *(TERM & YEAR)*
Spring 2020

Grading *(Select One Option)*
Regular (●)
Sat/UnSat ( )

Course Description *(Syllabus must be attached; see Guidelines)*
Course covers the fundamental concepts to determine the wind and seismic forces used in the design of buildings. Using the provisions of ASCE 7, wind and seismic force magnitudes, distributions and direction are determined for typical buildings. Wind forces are studied for the MWFRS, and for the Components and Cladding. Dynamic analysis of SDOF and MDOF building models are studied. Load transfer through the diaphragm to the lateral force resisting system is studied to determine member forces, drift and torsion.

Prerequisites	**Corequisites**	**Registration Controls** *(Major, College, Level)*
CES 3102C		

Prerequisites, Corequisites and Registration Controls are enforced for all sections of course

Minimum qualifications needed to teach course:	**List textbook information in syllabus or here**
Member of the FAU graduate faculty and has a terminal degree in the subject area (or a closely related field.)	
Faculty Contact/Email/Phone Prof. Barry Rosson/rosson@fau.edu/7-4554	**List/Attach comments from departments affected by new course**

Approved by	***Date***
Department Chair	10/17/2019
College Curriculum Chair	10/17/2019
College Dean	10/17/2019
UGPC Chair	
UGC Chair	
Graduate College Dean	
UFS President	
Provost	

Email this form and syllabus to UGPC@fau.edu one week before the UGPC meeting.

GRADUATE COLLEGE
OCT 18 2019

Department of Civil Environmental and Geomatics Engineering
Florida Atlantic University
Course Syllabus

1. Course title/number, number of credit hours	
Advanced Building Design	3 credit hours
2. Course prerequisites, corequisites, and where the course fits in the program of study	
Prerequisites: CES 3102C	
3. Course logistics	
Term: TBA This is a classroom lecture course. *Class location and time*: TBA 1. Students are required to make two formal presentations during the term. 2. All communication with the instructor outside of class must be conducted via email using the students FAU email account. 3. Communication with the instructor regarding Presentation grades, Exam grades and the final course grade must be conducted in person during office hours. 4. Presentations and exams are given only at the scheduled times in the classroom. No make-ups are given, except for students with an excused absence.	
4. Instructor contact information	
Instructor's name *Office address* *Office Hours* *Contact telephone number* *Email address*	Dr. Barry Rosson, P.E., Professor Engineering West (Bldg 36), Room 213 TBA 561-297-4554 rosson@fau.edu
5. TA contact information	
Not applicable	
6. Course description	
This course provides an introduction to the fundamental concepts used in structural engineering to determine the wind and seismic forces used in the design of buildings. We begin by studying the damage due to wind and seismic forces and the common lateral force resisting systems used for these loads. Using the provisions of ASCE 7 (Chapters 27 and 28), we will study how the wind load magnitudes, distributions and direction are determined. The wind forces will be determined using the MWFRS Regular Approach (Directional Procedure and Envelope Procedure) and Simplified Approach. The wind pressures for the Components and Cladding (C&C) will be determined using the provisions in ASCE 7 (Chapter 30). We will then study structural dynamic behavior for single-degree-of-freedom (SDOF) systems and for multi-degree-of-freedom (MDOF) systems. This will include the development of the stiffness matrix, mass matrix and damping matrix for idealized two-dimensional building models. Using commonly available software the building's natural frequencies and mode shapes will investigated. We will then study the different types of Seismic Lateral Force Resisting Systems and using ASCE 7 (Chapter 18) to determine the seismic loads, distributions and direction using the Equivalent Lateral Force Procedure. Transferring the wind and seismic forces through the floor diaphragms to the lateral force resisting systems will be studying using MASTAN2 to investigate the member forces, building drift and torsion. Assignments will emphasize the use of the provisions in ASCE 7 to determine the wind and seismic forces on the buildings. Structural response will be investigated using the modeling capabilities of MASTAN2.	

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7. Course objectives/student learning outcomes/program outcomes

Course objectives	1. Provide students with an understanding of the many factors that influence the design loads on buildings and the approaches taken in ASCE 7 to determine and apply the wind forces to the MWFRS and C&C. 2. Provide students with an understanding of how rigid and flexible floor diaphragms distribute the wind forces to the MWFRS. 3. Provide students with an understanding of the many factors that influence the seismic design loads on buildings. 4. Provide students with sufficient structural dynamics theory to understand the design procedures taken in ASCE 7 to determine and apply the seismic design loads to the lateral force resisting system. 5. Provide students with an understanding of how rigid diaphragms distribute seismic forces and how torsional effects develop. 6. Introduce how to model and assess the building for drift and torsional effects using the modeling capabilities of MASTAN2.
Student learning outcomes & relationship to program/ ABET outcomes 1-7	A. Students develop an ability to understand how the various factors unique to the building affect the wind and seismic forces. (1, 2, 4) B. Students learn how to use the various design procedures in ASCE 7 to determine and apply the wind and seismic forces. (1, 2, 4) C. Students know how to determine the natural frequencies and mode shapes for idealized two-dimensional building models. (1, 7) D. Students learn how diaphragms distribute forces to the lateral force resisting systems and how they affect building drift and torsion. (1, 4) E. Students learn how to develop 3-D models in MASTAN2 to assess member forces, drift and torsional effects. (1, 2) F. Students learn to develop and give professional presentations. (3)

8. Course evaluation method

In-Class Presentation #1	10%
Exam #1	35%
In-Class Presentation #2	10%
Project	10%
Exam #2	35%

9. Course grading scale

A	(100 – 93)	A-	(92 – 90)	B+	(89 – 87)
B	(86 – 83)	B-	(82 – 80)	C+	(79 – 77)
C	(76 – 73)	C-	(72 – 70)	D+	(69 – 67)
D	(66 – 63)	D-	(62 – 60)	F	(59 – 0)

10. Policy on exams, homework, in-class problems, excused absence, and incomplete course grade

Exams will only be given in class and at the scheduled times. Exceptions to this policy will only be granted to students with an excused absence.

In-Class Presentations will be given by all students. A list of problems will be given from which each student will select his/her presentation. It is expected that each student will work all the problems to prepare for the exams and to be able to discuss the results during the in-class presentations.

Project will be assigned to each student consisting of an additional in-class presentation problem that will require an enhanced analysis and a more detailed discussion of the results.

Excused Absence: Students have the right to reasonable accommodations to participate in university approved activities, including athletic, scholastic, performance and debate activities. It is the student's responsibility to notify the instructor at least one week prior to the university-related activity. Other excused absences that preclude participation in class include an illness or injury (*as properly documented by a health care provider*), or a hardship that is extraordinary as determined by the instructor. When in doubt as to the severity of the hardship, and if possible to do beforehand, please seek approval by email from me prior to missing class. Confirmation from me in this way ensures there will be no doubts or confusion as to whether or not the absence will be considered excused.

Incomplete Course Grade: A student who is passing the course, but has not completed all required work due to an exceptional circumstance, may temporarily receive a grade of incomplete (I). The assignment of this grade is given at the discretion of the instructor; my policy is to give students this grade only when necessary and if Exam #1 has been completed. The remaining work and the time-frame in which to complete the course are given at the time the (I) grade is assigned. This grade automatically becomes a failing (F) grade if all remaining work is not completed as stipulated or within a maximum 12-month period.

11. Special course requirements

None

12. Classroom etiquette policy

- The lecture will begin promptly at 7:10 PM. As a courtesy to me and to your fellow classmates, please be in your seat and ready for class prior to 7:10 PM. On the rare occasion that you are running late, please arrive no later than 7:20 and sit near the door to minimize disruption. If you cannot arrive by 7:20 PM, see me during office hours to discuss the class material and notes you missed.
- Although class role will not be taken, you are expected to attend all lectures.
- Cell phones and laptops are not to be used for any reason during class. Please place them in your backpack or bag and place under your seat.
- Recording and camera features of your cell phone are not to be used for any reason during class.

13. Attendance policy statement

Students are expected to attend all classes and to satisfy all academic objectives as outlined by the instructor. The effect of absences upon grades is determined by the instructor, and the University reserves the right to deal at any time with individual cases of non-attendance. Refer to Section 10 for specific information on how to receive an excused absence and how an unexcused absence can affect your grade.

14. Disability policy statement

In compliance with the Americans with Disabilities Act Amendments Act (ADAAA), students who require reasonable accommodations due to a disability to properly execute coursework must register with Student Accessibility Services (SAS) and follow all SAS procedures. SAS has offices across three of FAU's campuses – Boca Raton, Davie and Jupiter – however disability services are available for students on all campuses. For more information, please visit the SAS website at www.fau.edu/sas/.

15. Counseling and Psychological Services (CAPS) Center

Life as a university student can be challenging physically, mentally and emotionally. Students who find stress negatively affecting their ability to achieve academic or personal goals may wish to consider utilizing FAU's Counseling and Psychological Services (CAPS) Center. CAPS provides FAU students a range of services – individual counseling, support meetings, and psychiatric services, to name a few – offered to help improve and maintain emotional well-being. For more information, go to http://www.fau.edu/counseling/

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16. Code of Academic Integrity policy statement	
Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty is considered a serious breach of these ethical standards, because it interferes with the university mission to provide a high quality education in which no student enjoys unfair advantage over any other. Academic dishonesty is also destructive of the university community, which is grounded in a system of mutual trust and place high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. See University Regulation 4.001 at www.fau.edu/regulations/chapter4/4.001_Code_of_Academic_Integrity.pdf	
17. Required texts/reading	
No required textbook.	
18. Course topical outline, including dates for exams/quizzes, papers, completion of reading	
Design of Buildings for Wind Loads	
Objectives	Provide students with an understanding of the many factors that influence the design loads on buildings. Introduce the approaches taken in ASCE 7 to determine and apply the wind forces to the Main Wind Force Resisting System (MWFRS) and to the Components and Cladding (C&C). Provide students with an understanding of how rigid and flexible floor diaphragms distribute wind forces to the MWFRS. Introduce how to model and assess the building for drift and torsional effects using the three-dimensional modeling capabilities of MASTAN2.
Outcomes	Students develop an ability to understand how the various factors such as risk category, wind speed, enclosure classification, exposure category and topography affect the magnitude, distribution and direction of wind pressures on the building. Students learn how to use the various design procedures in ASCE 7 to determine the design loads and apply the wind loads to the MWFRS and C&C. Students learn how diaphragms distribute forces to the MWFRS and the effect they have on building drift and torsion. Students learn how to develop 3-D models in MASTAN2 to assess member forces, drift and torsional effects.
Assessments	In-Class Presentation and Exam #1
Weeks 1 - 8	Building Damage Due to Wind and Seismic Forces Lateral Force Resisting Systems Load Combinations for the Design of Buildings Wind Load Magnitude, Distribution and Direction MWFRS Regular Approach: Directional Procedure and Envelope Procedure Simplified Approach C&C Rigid and Flexible Floor Diaphragms Modeling Structural Response Due to Wind Loads Building Drift and Torsion
Week 9	Exam #1
Design of Buildings for Seismic Loads	
Objectives	Provide students with an understanding of the many factors that influence the seismic design loads on buildings. Give students sufficient structural dynamics theory to understand the design procedures taken in ASCE 7 to determine and apply the seismic design loads to the Lateral Force Resisting System of the building. Provide students with an understanding of how rigid diaphragms distribute seismic forces and the torsional effects that can develop.

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Outcomes	Students develop an ability to determine the natural frequencies and mode shapes of two-dimensional multi-degree-of-freedom (MDOF) systems. Students develop an ability to understand how the various factors such as site class, design spectral acceleration parameters, importance factor, risk category and seismic design category affect the seismic design forces. Students learn how to use the Equivalent Lateral Force Procedure in ASCE 7 to determine and apply the seismic loads to the building. Students learn how to develop 3-D models with rigid diaphragms in MASTAN2 to assess member forces, drift and torsional effects.
Assessments	In-Class Presentation and Exam #2
Weeks 10 - 15	Modeling Structural Dynamic Behavior Single-Degree-Of-Freedom (SDOF) Systems Multi-Degree-Of-Freedom (MDOF) Systems Stiffness Matrix, Mass Matrix and Damping Matrix Natural Frequencies and Mode Shapes Types of Seismic Lateral Force Resisting Systems Seismic Load Magnitude, Distribution and Direction Equivalent Lateral Force Procedure Modeling Structural Response Due to Seismic Loads Building Drift and Torsion
Week 16	Exam #2

19. Assignment Presentation (Required Format)

In-Class Presentations must be presented in a clear and legible format:
1. PowerPoint is the required presentation format.
2. All material must be suitable for uploading and storage on Canvas as ***.ppt** and ***.pdf** files.
3. Use appropriate size font, lines, and colors that allow for easy interpretation of results.
4. Scans of hand calculations are acceptable if placed as images in PowerPoint and are very neat & clear.
5. PowerPoint and PDF files are to be sent to rosson@fau.edu **by noon the day before the assigned presentation** for a full review. Edits from the review are often required, so plan accordingly.

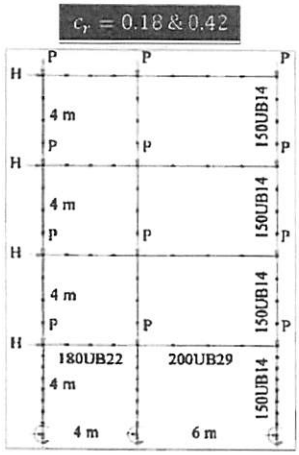
* All **text and computations** must be written in a clear and professional manner using the following guidelines:
1. Solution development must follow a logical flow and labeled accordingly with proper units.
2. Any assumptions not readily apparent from the context and subject of the problem need to be mentioned and justified.
3. Use a straight edge or CAD software for figures, with dimensions as close to scale as possible.

* All **graphs** must be presented in a clear and legible format:
1. Label the x and y axes using the appropriate variable and units in parenthesis.
2. When plotting multiple curves, provide a legend for each curve.
3. Use an appropriate size font and reasonable dimensions for each axis.
4. Unless printing in color, use different line types (solid, dashed, dotted, etc.).
5. Plot the results using Excel or any other similar type of graphical output.

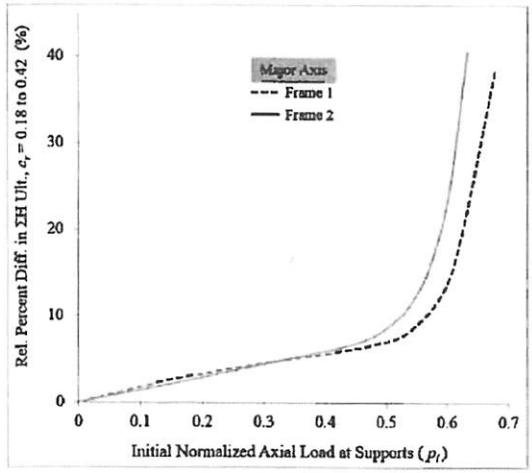
* All **Excel files** used in the presentation must be submitted in the following format:
1. The File Name must include the Presentation Number and the Student's Last Name (Example: Presentation1Rosson.xlsx).
2. Excel programs with variables defined and input/output cells clearly delineated.
3. Programs must follow a logical sequence of computations from one step to the other.
4. Excel files are to be sent as attachments to rosson@fau.edu.

20. Example PPT Presentation Slides

RELATIVE PERCENT DIFFERENCE IN ULTIMATE LOAD H CONDITIONS



Shayan *et al.* Frame 2



ULTIMATE LOAD FACTOR RESULTS FOR FRAMES 1 & 2

Major Axis	Frame 1		Frame 2	
	Shayan *et al.*	$n = 4$	Shayan *et al.*	$n = 4$
$c_r = 0$	1.454	1.450	1.154	1.178
$c_r = 0.18$	1.368	1.425	1.090	1.158
$c_r = 0.24$	1.339	1.415	1.065	1.152
$c_r = 0.30$	1.307	1.400	1.040	1.144
$c_r = 0.36$	1.277	1.390	1.016	1.136
$c_r = 0.42$	1.246	1.375	0.992	1.126