University of Florida
Department of Civil and Coastal Engineering

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CGN 4905/TTE 6205
FREEWAY OPERATIONS AND SIMULATION

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Course Description: This course addresses the area of freeway operations analysis and simulation. Topics covered include: uninterrupted traffic flow theory; analysis with Highway Capacity Manual methods; microscopic simulation, and freeway management and control methods. This is a 3-credit course.

Pre-requisite: Permission of Instructor

Background and Course Objectives: Freeway facilities are intended to offer the highest level of mobility of any component within the roadway network. Freeways are also generally responsible for moving the largest volume of traffic in the network. Given the vital purpose that these roadway facilities serve, it is essential for the traffic engineer to be able to properly analyze these facilities, under a variety of traffic demand, geometric, and management/control configurations.

This course has five primary learning objectives. In this course, the student is expected to…

1. learn the fundamental principles underlying traffic flow on freeway facilities
2. learn how to analyze the operational impacts of freeway traffic flow with the analytical methods of the Highway Capacity Manual (HCM)
3. learn how to apply a simulation tool to the analysis of freeway operations
4. develop an understanding of the limitations of both the HCM analysis methods and of microsimulation
5. develop an understanding of the differences in results generated by the HCM analysis methods and simulation for situations in which both can be applied for the analysis.

Instructor: Dr. Scott Washburn
Departmentof Civil and Coastal Engineering
580-A Weil Hall
Email: swash@ce.ufl.edu
Web site: https://swash.essie.ufl.edu/
Office Hours: Wednesday, Thursday: 9:30–11:00 AM; or by appointment

Course Website: http://elearning.ufl.edu/

Meeting Times:

- Tuesday, Periods 8-9 (3:00 PM - 4:45 PM), 105 min
  - Except 9/14, 10/12, 11/9; Class will meet just during Period 9 (4:05-4:55), 50 min
    - Conflict with University Transportation/Parking Committee meeting
- Thursday, Period 9 (4:05 PM - 4:55 PM), 50 min

Meeting Location:

- CSE E107 (lower level)
- https://campusmap.ufl.edu/#/index/0042
- Lat/Long: 29.648446951567966, -82.34450396387246

Class Format:
- Generally a 'flipped' classroom model
- It is expected that you will read relevant material prior to class session(s) in which topic will be covered
- With only a couple of exceptions, I will not be giving 'lectures' in class
- I will mostly be working example problems, and walking you through all or part of some problem assignments
- We may still have plenty of discussion of the subject for that day's class session, but it will primarily be of a question and answer format

Topics Covered:
- Uninterrupted flow fundamentals
- HCM freeway analysis methodologies
  - Basic segments
  - Merge/diverge segments
  - Weaving segments
  - Facility (undersaturated and oversaturated)
  - Travel time reliability
- Managed lanes
- Ramp metering
- Simulation

Reference Material:

eBook (provided) In 'Files' section of Canvas course site
Textbook (optional): *Principles of Highway Engineering and Traffic Analysis*, 7th Edition Mannering and Washburn; Wiley & Sons, Inc.; ISBN 978-1-119-49396-9. https://www.wiley.com/en-us/Principles+of+Highway+Engineering+and+Traffic+Analysis%2C+7th+Edition-p-9781119493969   or https://www.vitalsource.com/products/principles-of-highway-engineering-and-traffic-fred-l-mannering-scott-s-v9781119493969?term=9781119493969
Highway Capacity Manual, 6th Edition (optional)   Electronic version is available for free at https://app.knovel.com/; Need to be on UF network (use VPN if off-campus, https://it.ufl.edu/ict/documentation/network-infrastructure/vpn/)
HCM Volume 4 (online only). Available at http://www.hcmvolume4.org/. Access is free, but need to sign up for a use account.
SwashSim Wiki (provided) https://swashsim.miraheze.org/

Software Requirements/Recommendations:

- HCM-CALC: https://github.com/swash17/HCM-CALC (provided for free)
- SwashSim: https://github.com/swash17/SwashSim (provided for free)
- A program for creating digital documents, for example:
  - MS Word
  - Overleaf (https://www.overleaf.com/)
  - R Markdown (https://rmarkdown.rstudio.com/)
  - These tools are either free to everyone or UF has licenses for free student use. Also see https://software.ufl.edu/ and https://info.apps.ufl.edu/ for other options.

Computer Requirements: https://www.eng.ufl.edu/students/resources/computer-requirements/

Class Attendance: There is no specific attendance policy. However, students are strongly encouraged to attend all class meetings, as this will certainly improve your likelihood for success in this course. Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies. Click here to read the university attendance policies: https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/

Class Demeanor and Etiquette: This should follow the rules of common sense. Students are encouraged to participate in class discussion and to initiate such discussion whenever they feel that they or the class could benefit from a dialog with the instructor. Other actions that disturb the class are *strongly* discouraged. Use of a laptop for class-related activities is acceptable, and may even be necessary in some cases. However, laptops/tablets/cell phones should not be used for non-class activities (e.g., engaging in chat room discussions, E-mail, or surfing the web). ***Cell phones and pagers should be turned off or muted*** (if you need it for potential emergency notification, please alert me to this prior to the start of class). There is no official dress code for this class, but please dress appropriately. Again, use common sense—if the outfit is something you typically wear in the bedroom, or on the beach, it is likely that it is not appropriate for the classroom.

Grading: Your grade in this course will be based on the following components:

Component	#	Total Points	% of Total Points	Notes
Assigned Reading Quizzes	15	150	12.5	Average 8 questions/quiz × 1.25 points/question = 10 points/quiz
Problem Assignments	8	750	62.5	Points vary by assignment. See Canvas for specific point breakdown by assignment.
Exams	2	300	25.0	150 points per exam
Total		**1200**	**100.0**	

Assigned Reading Quizzes

- Done through Canvas.
- Quiz will be available by 9:00 AM the day prior to the class session in which topic will be covered:
    - Monday, 9:00 AM, for topic coverage in Tuesday's class session
    - Wednesday, 9:00 AM, for topic coverage in Thursday's class session
- Quiz will be due and scored at 9:00 PM the day following the class session in which topic was covered:
    - Wednesday, 9:00 PM, following topic coverage in Tuesday's class session
    - Friday, 9:00 PM, following topic coverage in Thursday's class session
- I will answer questions directly or indirectly related to quiz questions during class session in which the relevant reading is covered.
- If you ultimately answer at least 80% of the questions correctly, you will receive the total number of points possible for the assigned reading quizzes, otherwise you receive the points corresponding to the number of questions answered correctly.
    - In other words, if you score at least 120 out of 150 points for the reading quizzes, you will receive a total of 150 points toward your final grade. If you score 119 or fewer points, you will receive exactly that number of points toward your final grade.

Problem Assignments

Problem assignment solutions will be submitted through Canvas, in a digital-native format (i.e., not scans of handwritten material). Refer to the previous section on software for suggestions on programs/tools for creating digital documents.

1. Uninterrupted Flow Fundamentals (should primarily be refresher from introductory transportation engineering course)
2. HCM Segment LOS and Service Volumes
3. HCM Facility Undersaturated, some in-class work
4. HCM Facility Oversaturated, entirely in-class work
5. HCM Facility Travel Time Reliability, entirely in-class work
6. HOV Lanes and Ramp Metering
7. Simulation 1 (vehicle entry, speed-flow, link/detector measures, simulation vs HCM results), some in-class work
8. Simulation 2 (ramp metering), some in-class work

Exams

- Current plan is for exams to be conducted through Canvas, but that may be subject to change.
- If you are an EDGE student, please register in advance of exam dates with ProctorU.
- Topics covered in first exam:
  - Uninterrupted flow fundamentals, HCM freeway segments (LOS, service volumes)
- Topics covered in second exam:
  - HCM freeway facilities, managed lanes, ramp metering
- Each exam will be worth 150 points (+/─). Total will be 300 points.

Late Submissions

- Late submissions for assigned reading quizzes are not allowed. If a quiz is not submitted by the due date/time, the score will be recorded as zero.
- Late submissions for problem assignments will be accepted up to 48 hours after the original due date/time. A late penalty of 15% will be applied. No points will be given for problem assignments turned in after 48 hours past the original due date/time.

Grading Scale

- Grades will be given at the end of the semester based only on the work completed during the semester.

Total Points Earned	Percentage of Available Points	Final Grade	Grade Points
1128 - 1200	≥ 94.0 %	A	4.00
1080 - 1127	90.0 - 93.9 %	A−	3.67
1032 - 1079	86.0 - 89.9 %	B+	3.33
984 - 1031	82.0 - 85.9 %	B	3.00
936 - 983	78.0 - 81.9 %	B−	2.67
888 - 935	74.0 - 77.9 %	C+	2.33
840 - 887	70.0 - 73.9 %	C	2.00
792 - 839	66.0 - 69.9 %	C−	1.67
744 - 791	62.0 - 65.9 %	D+	1.33
696 - 743	58.0 - 61.9 %	D	1.00
648 - 695	54.0 - 57.9 %	D−	0.67
0 - 647	< 54.0 %	E	0.00

More information on UF grading policy may be found at:
https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx
http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades

Class Policy on Student Collaboration: It is acceptable to work with other classmates, and even recommended, to assist your learning of the material required to complete the assignments. It is NOT acceptable to copy another person's or group's assignment solution(s). Every student (or team in the case of team assignments) is responsible for turning in an individual assignment that represents their own work. Collaboration during quizzes/exams is strictly prohibited.

Course Audio/Video Recordings for Remote/Virtual Instruction: If the need arises for our class modality to shift to remote/virtual, online class sessions through Zoom or similar may be recorded (audio and video). Students who participate with their computer camera (aka "webcam") enabled 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 the class session 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. Regarding the sharing or distribution of class audio/video material, see the section on 'In-Class Recording' below.

University Policies

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) 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.

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
• Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
• Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

Students Requiring Accommodations: Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the Disability Resource Center. Click https://disability.ufl.edu/students/get-started/ to get started with the Disability Resource Center. 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.

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: http://registrar.ufl.edu/catalog0910/policies/regulationferpa.html

Software Use: All faculty, staff and student 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.

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.

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) 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.

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: Visit https://counseling.ufl.edu or call 352-392-1575 for information on crisis services as well as non-crisis services.

Student Health Care Center: Call 352-392-1161 for 24/7 information to help you find the care you need, or visit https://shcc.ufl.edu.

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

Sexual Assault Recovery Services (SARS)
Student Health Care Center, 392-1161.

UF Health Shands Emergency Room / Trauma Center: For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; https://ufhealth.org/emergency-room-trauma-center.

University Police Department: Visit https://police.ufl.edu or call 352-392-1111 (or 9-1-1 for emergencies).

COVID-19:
https://coronavirus.ufl.edu/
https://coronavirus.ufhealth.org/
https://coronavirus.ufhealth.org/screen-test-protect-2/frequently-asked-questions/covid-19-exposure-and-symptoms-who-do-i-call-if/

Academic Resources

E-learning technical support: Contact the UF Computing Help Desk at https://helpdesk.ufl.edu/ at 352-392-4357 or via e-mail at helpdesk@ufl.edu.

Career Connections Center: Reitz Union Suite 1300, 352-392-1601. Career assistance and counseling services, https://career.ufl.edu/.

Library Support: Various ways to receive assistance with respect to using the libraries or finding resources, https://uflib.ufl.edu/find/ask/.

Teaching Center: Broward Hall, 352-392-2010 or to make an appointment 352-392-6420. General study skills and tutoring, https://teachingcenter.ufl.edu.

Writing Studio: 2215 Turlington Hall, 352-846-1138. Help brainstorming, formatting, and writing papers. https://writing.ufl.edu/writing-studio

Student Complaints On-Campus: Visit https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code for more information.

On-Line Student Complaints: Visit https://distance.ufl.edu/getting-help/student-complaint-process/ for more information.