Arizona State University  
School of Sustainable Engineering and the Built Environment  
CEE 598 (33450): Activity-Travel Behavior Modeling: Methods and Applications  
Spring 2020 Syllabus  

INSTRUCTOR: Dr. Ram M. Pendyala, Professor  
OFFICE: CAVC Room 502  
PHONE: 480-727-4587  
EMAIL: ram.pendyala@asu.edu (best means of communication)  
OFFICE HOURS: By appointment, e-mail, and virtual online meetings  
CLASS MEETS: Room WGHL L1-04  
March 9: 10 AM to 5 PM  
March 10-12: 9:30 AM to 4:30 PM  
March 13: 9:30 AM to 3 PM  
CLASS DATES: March 9 to March 13, 2020  
CREDIT HOURS: 3  
ASSOCIATE INSTRUCTORS: Shivam Sharda, ssharda@asu.edu; Taehooie Kim, tkim91@asu.edu  

COURSE DESCRIPTION  
Emerging techniques for modeling traveler choices and forecasting travel demand under a wide variety of socio-economic, demographic, built environment, modal, and network scenarios; new computational travel forecasting and modeling tools based on the principles of microsimulation; hands-on exercises in the use of activity-based travel modeling methods; interpretation and use of the model outputs for transportation planning and policy analyses.  

COURSE OBJECTIVES  
This course is intended to serve as a graduate course that provides in-depth coverage of activity-travel behavior analysis methods with an emphasis on the specification, estimation, and application of activity-travel behavior models for demand forecasting. The course covers a variety of statistical and econometric methods that are being used in research and practice for modeling, understanding, explaining, and forecasting activity-travel demand. Students will be taught how to deploy statistical and econometric choice models in a microsimulation environment. At the end of the course, students will:  
• Have a thorough and deep understanding of travel behavior characteristics and the socioeconomic and demographic factors/trends that affect activity-travel patterns  
• Be able to analyze activity-travel behavior characteristics using a variety of statistical approaches  
• Be able to specify and estimate state-of-the-art statistical and econometric models of activity-travel behavior that can be used in practice for policy analysis and forecasting  
• Have developed an interdisciplinary appreciation for the field of travel behavior research  
• Be able to use selected statistical and econometric software packages for analyzing and modeling activity-travel demand  
• Have the skills needed to apply advanced microsimulation models, such as synthetic population generation tools, for activity-travel demand forecasting
ATTENDANCE POLICY
Students must attend all class meetings in their entirety. Any absences must be discussed with and approved by the instructor.

RELIGIOUS OBSERVANCE POLICY
If special accommodations are needed for religious reasons, please inform the instructor as soon as possible and no later than the third week of class.

MAKE-UP/MISSED WORK POLICY
Special accommodation may be granted in the event of exceptional circumstances beyond the control of the student such as a medical condition, family tragedy, etc. All such circumstances must be explained and supported by proper verifiable documentation.

ASSIGNMENTS/PROJECTS
Numerous assignments/projects will be assigned throughout the course. Students should plan to submit completed assignments/projects on the target due date. All assignments/projects must be submitted in a professional format as per the instructions specified in the assignment/project.

DISPOSITION OF WORK
All exams and any other work that has not been collected by the students and remaining in the custody of the instructor will be discarded on August 15, 2020.

ACADEMIC DISHONESTY (DISRUPTION OF ACADEMIC PROCESS) POLICY
Students in this class must adhere to ASU’s academic integrity policy, which can be found at https://provost.asu.edu/academic-integrity/policy. Students are responsible for reviewing this policy and understanding each of the areas in which academic dishonesty can occur. In addition, all engineering students are expected to adhere to both the ASU Academic Integrity Honor Code and the Fulton Schools of Engineering Honor Code. All academic integrity violations will be reported to the Fulton Schools of Engineering Academic Integrity Office (AIO). The AIO maintains record of all violations and has access to academic integrity violations committed in all other ASU college/schools.

Academic dishonesty (plagiarism, cheating, and disruption of academic process) will not be tolerated under any circumstances and will result in severe consequences. Appropriate action will be taken on a case-by-case basis at the discretion of the instructor within the broad policy framework of the university. While collaboration is OK, cheating is NOT! Cheating includes copying solutions written by others, and using or sharing work with others. Students must protect and safeguard their work and ensure that others cannot access their work. Penalties for academic dishonesty may include withdrawal from the course with an “XE” grade for everyone involved in the incident. If students are unsure of the difference between collaboration and cheating, they should consult the instructor in a timely manner. All class rules (specified on the last page of this syllabus) must be followed; any violation of a class rule will be treated as “disruption of academic process” and dealt with accordingly.

PASS/FAIL GRADE POLICY
This course is not offered on a Pass/Fail grading basis.
INCOMPLETE GRADE POLICY
An “Incomplete” grade is awarded only when a request is made in writing explaining exceptional circumstances that are supported by proper documentation. An Incomplete grade will be assigned at the sole discretion of the instructor. The student must have completed at least 80 percent of the coursework to be eligible to receive an Incomplete grade.

COURSE MATERIAL AND COPYRIGHT
- Course notes and other materials/handouts will be made available online through Canvas. Some handouts may be photocopied and provided in class, as needed.
- Course content, including lectures, are copyrighted materials and students may not share outside the class, upload to online websites not approved by the instructor, sell, or distribute course content or notes taken during the conduct of the course (see ACD 304–06, “Commercial Note Taking Services” and ABOR Policy 5-308 F.14 for more information).
- Student’s must refrain from uploading to any course shell, discussion board, or other course forum, material that is not the student’s original work, unless the students first comply with all applicable copyright laws; faculty members reserve the right to delete materials on the grounds of suspected copyright infringement.

GRADING DISTRIBUTION

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<thead>
<tr>
<th>Item</th>
<th>Weight</th>
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<tbody>
<tr>
<td>5 Projects</td>
<td>90%</td>
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<tr>
<td>Class Participation</td>
<td>10%</td>
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<tr>
<td>Total</td>
<td>100%</td>
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PROJECTS
- The projects involve the analysis of real-world travel behavior data sets. In this course, you will primarily use a subsample of 2009 and 2017 National Household Travel Survey (NHTS) data sets (http://nhts.ornl.gov), and the 2000 Swiss Microcensus data set.
- Students may work alone or collaboratively to complete the projects. In general, students are encouraged to collaborate and consult with one another as they undertake the assignments. However, each student must submit completed assignments individually. Plagiarism is prohibited, but collaboration is encouraged.
- Students will have an opportunity to exercise a few models and software packages hands-on within the classroom. Students should bring a laptop computer to class, and ensure they have appropriate administrative privileges on the machine. Students who cannot bring a laptop computer to class may pair up with another student in class to follow along.
- Students will be provided access to software as needed to complete the projects.

CLASS AND CAMPUS RULES
It is absolutely essential to maintain a professional environment in the classroom.
- Please do not eat in the classroom. You may have a drink as long as it is not disruptive to the class.
- All portable electronic devices including cell phones, computers, tablets, etc. must be turned off and put away, completely out of sight, unless they are being used specifically for class purposes.
- Please refrain from reading newspapers or magazines, doing crossword puzzles, surfing the internet, using e-mail or social media programs, or working on assignments of other classes during this class.
• If you are coming to class, please try to be on time, fully realizing that you must navigate the transportation system safely.
• Please do not engage in any activity (e.g., talking) that will disrupt the classroom and disturb the instructor or your fellow students.
• Students, faculty, staff, and other individuals do not have an unqualified right of access to university grounds, property, or services. Interfering with the peaceful conduct of university-related business or activities or remaining on campus grounds after a request to leave may be considered a crime. All incidents and allegations of violent or threatening conduct by an ASU student (whether on- or off-campus) must be reported to the ASU Police Department (ASU PD) and the Office of the Dean of Students.

The purpose of these class and campus rules is to eliminate activity that is disruptive to the academic process. Most students view these as a common courtesy to the instructor and fellow students. Failure to comply with a class rule will be viewed as a Disruption to the Academic Process.

SPECIAL ACCOMMODATIONS
Suitable accommodations will be made for students having disabilities. Students needing accommodations must register with the ASU disabilities resource Center and provide documentation of that registration to the instructor. Students should communicate the need for an accommodation in sufficient time for it to be properly arranged. If you wish to request an accommodation due to a documented disability, please inform your instructor and contact Disability Resource Center (http://eoss.asu.edu/drc) as soon as possible. They can be reached at drc@asu.edu or 480-965-1234 (voice).

HARASSMENT AND SEXUAL DISCRIMINATION
Arizona State University is committed to providing an environment free of discrimination, harassment, or retaliation for the entire university community, including all students, faculty members, staff employees, and guests. ASU expressly prohibits discrimination, harassment, and retaliation by employees, students, contractors, or agents of the university based on any protected status: race, color, religion, sex, national origin, age, disability, veteran status, sexual orientation, gender identity, and genetic information.

Title IX is a federal law that provides that no person be excluded on the basis of sex from participation in, be denied benefits of, or be subjected to discrimination under any education program or activity. Both Title IX and university policy make clear that sexual violence and harassment based on sex is prohibited. An individual who believes they have been subjected to sexual violence or harassed on the basis of sex can seek support, including counseling and academic support, from the university. If you or someone you know has been harassed on the basis of sex or sexually assaulted, you can find information and resources at https://sexualviolenceprevention.asu.edu/faqs.

Mandated sexual harassment reporter: As an employee of the University I am considered a mandated reporter and therefore obligated to report any information regarding alleged acts of sexual discrimination that I am informed of or have a reasonable basis to believe occurred. ASU Counseling Services, https://eoss.asu.edu/counseling, is available if you wish to discuss any concerns confidentially and privately.
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<thead>
<tr>
<th>Class</th>
<th>Time Period</th>
<th>Topic/Exercise</th>
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<tbody>
<tr>
<td>3/9</td>
<td>10:00 – 11:30</td>
<td>Introduction to Activity-Based Travel Demand Analysis; Foundations of Microsimulation-Based Paradigms and Agent-Based Models</td>
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<td></td>
<td>11:30 – 12:30</td>
<td>In-Class Lunch; Download and Install Data Sets, Codes, and Software Packages</td>
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<td>12:30 – 1:45</td>
<td>Working with Activity-Travel Behavior Data Sets; Statistical Analysis of Activity-Travel Behavior Characteristics; Hypothesis Testing</td>
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<td>2:05 – 3:25</td>
<td>Tutorial: Introduction to R, Using R Codes to Analyze Travel Survey Data</td>
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<td>3:45 – 5:00</td>
<td>Linear Regression Models of Activity Frequency; Error and Residual Analysis</td>
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<tr>
<td>3/10</td>
<td>9:30 – 10:45</td>
<td>Count Models including Poisson and Negative Binomial Regression, Zero-inflated Poisson and Negative Binomial Models</td>
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<tr>
<td></td>
<td>11:05 – 12:15</td>
<td>Tutorial: Linear Regression Models, Error and Residual Analysis, Inference and Application</td>
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<td>12:15 – 1:30</td>
<td>Lunch On Your Own</td>
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<td>1:30 – 3:00</td>
<td>Count Models including Poisson and Negative Binomial Regression, Zero-inflated Poisson and Negative Binomial Models (continued)</td>
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<tr>
<td>3/11</td>
<td>9:30 – 10:30</td>
<td>Introduction to Discrete Choice Modeling; Overview of Choice Model Components in Activity-Based Model Systems</td>
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<td>10:45 – 12:00</td>
<td>Multinomial Logit Model – Specification and Estimation; Multinomial Logit Model – Inference; Computing Elasticities and Marginal Effects; IIA Property</td>
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<td>12:00 – 2:00</td>
<td>Lunch On Your Own</td>
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<td>1:15 – 2:15</td>
<td>Tutorial: Multinomial Logit Model Estimation, Inference, and Application; Assessing Violations of IIA Property</td>
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<td></td>
<td>2:30 – 3:30</td>
<td>Nested Logit Model – Specification and Estimation; Ordered Probit Model – Formulation and Estimation</td>
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<td>3:50 – 4:30</td>
<td>Tutorial: Nested Logit Model Estimation; Ordered Probit Model Estimation and Application</td>
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<tr>
<td>3/12</td>
<td>9:30 – 10:30</td>
<td>Special Presentation: TOMNET - D-STOP Transformative Technologies in Transportation (T4) Survey by Dr. Sara Khoeini</td>
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<td>10:30 – 11:30</td>
<td>Special Presentation: Maricopa Association of Governments Activity-Based Model System by Dr. Vladimir Livshits</td>
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<td>11:30 – 12:45</td>
<td>Lunch On Your Own</td>
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<td>12:45 – 2:15</td>
<td>Multiple Discrete-Continuous Extreme Value (MDCEV) Model – Formulation and Specification for Tour Composition Modeling</td>
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<td>2:30 – 4:30</td>
<td>Tutorial: Estimation of MDCEV Model of Vehicle Fleet Composition; Application in Forecasting Mode</td>
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<td>3/13</td>
<td>9:30 – 10:45</td>
<td>Synthetic Population Generation Procedures; Formulation and Application</td>
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<td>12:15 – 1:30</td>
<td>Group Lunch (Location TBD)</td>
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<td>1:30 – 3:00</td>
<td>OpenAMOS: Overview and Demonstration of OpenAMOS (open source activity-mobility simulator)</td>
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SOME COURSE REFERENCES

There are numerous excellent books on statistics and econometrics that serve as useful references for this course. Here are a few specific references that are more travel behavior/modeling oriented, although there are many newer references that students are encouraged to explore and read.