CE 392E: ACQUISITION & ANALYSIS OF TRANSPORT DATA

Fall 2008 (#15945)

Lecture: 2 – 3:15 pm, Wednesday/Friday 7.202 ECJ

I. Office Hours for Dr. Kara Kockelman

Mondays 2:00-4:00 pm & Tuesdays 3:30-5 pm, 6.904 ECJ

Or, by appointment: 471-0210 (Office phone number) & kkockelm@mail.utexas.edu

II. Prerequisites

Graduate students are not required to have satisfied any specific courses as prerequisites for this course. However, those outside the transportation engineering major should receive permission from the instructor before enrolling in this course. And all students should have had at least one college course in probability or statistics.

III. Add/Drop Dates

From the 1st through the 4th class day, graduate students can drop or add a course on Rose or TEX. Beginning with the 5th class day, graduate students must initiate any adds or drops in their department. Graduate students can drop a class until the last class day with permission from the departmental Graduate Advisor and the Dean; poor course performance is not sufficient reason for such permission. Graduate students with GRA/TA/Grader positions or with Fellowships may not drop below 9 hours in a long session.

IV. Evaluation Plan

The College of Engineering Course/Instructor Survey will be used as the basic evaluation tool. All students are encouraged to submit written comments during this survey. Other formal assessment opportunities are likely to arise mid-semester; and students are strongly encouraged to provide feedback at any time during the course, in person or anonymously.

V. Grading

For purposes of grading, the performance of students enrolled in this course will be assessed using the following scoring system:

Homeworks	25% of score/grade
Course Project #1	30%
Course Project #2	20% (15% for report + 5% for presentation)
Examination(s)	25%

Note: The instructor reserves the right to consider Class Participation & Quizzes in the evaluation of a student's performance in the course. These items may contribute up to 15% of a student's grade, reducing the other percentages proportionally.

VI. Homework Assignments

Homework problems will be assigned roughly every two weeks and must be handed in at the *beginning* of the period in which they are due. After this time, they will be considered late and given *no credit*. However, ***all*** *assigned problems* ***must*** *be completed* (within 3 weeks of their due date and at least one week before the final exam) or a student's participation score will be adversely affected.

VII. Course Projects

Two course projects will be assigned. The first will be a team endeavor wherein students compose, administer, and evaluate the results of a home-and-travel energy-use survey of Austin

households. The second involves independent investigation, discussion, and application of a distinctive analytical approach to project 1's survey data (or other data, if the student desires). Such work will be followed by an oral presentation to the class (of roughly 10 minutes, with 5 minutes for questions & answers). Potential topics include generation of synthetic populations, endogeneity issues (and solution methods), block diagonal survey designs, factor analysis, structural equations modeling, Bayesian estimation, spatial econometric methods, and many others.

VIII. Examinations*

Only one course examination (a "midterm") is expected, towards the end of the semester, and this will take place outside of lecture hours. If student performance is an issue on this exam, there can be a final exam as well, to help students better master the material. The exams are scheduled for the following dates:

Midterm: Friday, November 19 (tentative)
Final Exam: Sunday, December 13, 2008, 2-5 pm (optional)

* The instructor reserves the right to periodically administer, grade, and use in student evaluation "pop"/unannounced *quizzes*. Students should come to class prepared to contribute to each class's lecture and discussion by staying up-to-date with homeworks and reading.

Make-up exams will *not* generally be given to any student. If a student is absent from a scheduled exam due to medical or other problems beyond her/his control and can plainly demonstrate this, the instructor can choose to give the student a completely different exam, additional assignments, and/or change the weighting of the student's various graded contributions.

IX. Text and Reader/Notes

The required textbook for this course is S. Lohr's *Sampling: Design and Analysis* (Duxbury Press 1999), and copies of assigned chapters will be made available via a local copier. The first edition of Richardson, Ampt, and Meyburg's *Survey Methods for Transport Planning* (Eucalyptus Press 1995) is also of interest and hard copies can be borrowed from the instructor and/or accessed on-line via www.TransportSurveyMethods.com.au. (Note: Many transport survey papers [and, eventually, the book's second edition] are available via the TUTI website: www.tuti.com.au.) Additional readings from Taylor, Young, and Bonsall's *Understanding Traffic Systems Data, Analysis, and Presentation* (Avebury 1996) and various journals may be assigned.

Updated versions of lecture notes will posted periodically online, for students to download. Any additional, required materials will be made available.

Since the course textbook does not cover all subjects the instructor will be teaching and does not include example problems, students are likely to need to consult other texts for further reading. A recommended econometrics text (for data analysis methods) is W.H. Greene's *Econometric Analysis* (any edition, MacMillan), and good texts on the subject of samping are W. Cochran's *Sampling Techniques* (Wiley 1963) and C. Särndal *et al.*'s rather advanced *Model Assisted Survey Sampling* (Springer 1992). In addition, J. Rice's *Mathematical Statistics and Data Analysis* is a nice book for students who are "rusty" on their probability and/or basic statistics.

X. Other Information

1. U.T. Austin provides upon request appropriate academic adjustments for qualified students with disabilities. Any student with a documented disability (physical or cognitive) who requires academic accommodations should contact the Services for Students with Disabilities area of the Office of the Dean of

Students at 471-6259 (or 471-4241, TDD) as soon as possible to request an official letter outlining authorized accommodations. The College of Engineering also has its own Director of Students with Disabilities, who can be reached at 471-4382. The instructor is available to privately discuss any special student needs, including disability accommodations.

2. According to *The General Information Catalog* "a student who is absent from a class or examination for the observance of a religious holy day may complete the work missed within a reasonable time after the absence, if *proper notice* of the planned absence has been given". The deadline for proper notification of such an absence is the fifteenth day of the semester.

3. Students in CE397 Topic 18 are encouraged and authorized to work on homework assignments together and prepare for exams together. However, all written work handed in by a student is considered to be his/her own work, prepared without *unauthorized* assistance. To ensure your actions never compromise your and our class's integrity, please visit http://www.utexas.edu/depts/dos/sjs/academicintegrity2.html. Students who violate University rules on scholastic dishonesty (*e.g.*, anything which gives unfair academic advantage to a student) are subject to disciplinary penalties, including the possibility of failure in the course and/or dismissal from the University. Since such dishonesty harms the individual, all students, and the integrity of the University, policies on scholastic dishonesty will be strictly enforced. An "F" grade will be the recommended penalty in most cases of scholastic dishonesty. One should refer to the Student Judicial Services website at http://www.utexas.edu/depts/dos/sjs/ to access the official University policies and procedures on scholastic dishonesty as well as further elaboration on what constitutes scholastic dishonesty.

XI. Course Content & (Tentative) Outline of Topics and Dates of Presentation

This course covers various aspects of transportation relating to the acquisition and analysis of transportation data. By the end of this course, students should be able to:

- design, develop, implement and evaluate actual surveys of stated & revealed travel behaviors; and
- identify & apply appropriate analytical tools for a variety of transport data types;

They also should be able to:

- reduce response & sampling errors;
- maximize response rates & data quality; and
- recognize subtleties in variable definitions (in order appropriately compute needed parameters).

To attain these objectives, we will systematically proceed through a series of topic modules in class, each with specific objectives, and students will undertake two course projects (and several homework assignments). Primary topics include experimental design and sampling, survey methods and data structure, hypothesis testing, and regression analyses. A tentative scheduling of the course topics is shown here.

LESSON TOPICS (+ Readings):

Topic 1. INTRODUCTION (Lohr's Ch. 1; RAM Ch. 1 & 2) – 1 lecture

Overview of Course
Study/Data Objectives
Discussion of Case Study & Final Projects

****Case Study***: Energy Consumption & Greenhouse Gas Emissions* – 1/2 lecture

Topic 2. DATA TYPES – 2 lectures

Human Behavior (& Opinion) – Stated vs. Revealed, & Cognitive Illusions (Course Notes)

Topic 3. SURVEY TYPES – 1 lecture

Self-completion vs. Interviewer; Telephone vs. Intercept (RAM Ch. 3)

Survey Method (PAPI, CATI, Web-based…) (RAM Ch. 3 + Course Notes)

Topic 4. SURVEY DESIGN & ADMINISTRATION – 3 lectures

Questionnaire Design: Instrument Format, Wording Choice, Question Ordering (Lohr 1.5 & RAM Ch. 5)
Minimizing Non-Response: Reminders & Incentives (RAM 7.1-7.4)
Sensitive Questions (Course Notes)
Need for Pilot Surveys (RAM Ch. 6)

Topic 5. PROBABILITY & STATISTICS REVIEW (Lohr's App. B & Ch. 2, RAM 4.5, + Course Notes) – 2 lectures

Probability (mean & covariance calculations, independence & conditioning)
Distributions (Bernoulli, geometric, Poisson; normal, Student's t, lognormal…)
Combining Variables (mean & variance of functions of variables)
Statistics (bias& precision, confidence intervals)
Hypothesis Tests

Topic 6. SAMPLING METHODS (RAM Ch. 4 & Lohr Ch. 2, 4-7) – 6 lectures

SRS – with & w/out replacement (Lohr Ch. 2)
Systematic (Lohr 5.6)
Stratified Sampling: Single & Multi-Stage (Lohr Ch. 4)
Cluster Sampling (Lohr Ch. 5 & 6)
Complex Surveys (Lohr Ch. 7)
Other (systematic sampling; double/two-phase samples, choice-based sampling, Bayesian sampling…)

Topic 7. SURVEY ISSUES – 4 lectures

Sample Size Calculations (RAM 4.6 & 4.6; Lohr 2.5, 4.5, 7.5 …)
Non-response & Imputation (Lohr Ch. 8)

Topic 8. DATA ANALYSIS & APPLICATION – 5 lectures

UNIT WEIGHTS/EXPANSION FACTORS:
Regression methods (Lohr Ch. 11)
Iterative Proportional Fitting (estimating expansion factors over 2+ dimensions) (Course Notes)
PROBABILITY: Manipulation of Distributions: The Delta Method; Converting pdfs; Length-based sampling (Course Notes)
REGRESSION MODELS (OLS, WLS, Discrete Choice, Systems of Equations) (Course Notes)

Note: Rice's & Greene's textbooks are valuable for further details on Topic 8 topics.

* Review for Midterm **Examination** * – 1 lecture

Topic 9. OTHER TOPICS – 2 lectures

Potential topics: DATA PROCESSING & STORAGE, REMOTELY SENSED DATA, RANDOM NUMBER GENERATION, ETC.

STUDENT PRESENTATIONS of Project #2 Work – 2 lectures

FIELD TRIP & GUEST LECTURES: If there is sufficient interest, we may visit UT's Office of Survey Research or NuStats' San Marcos call center, to see how phone surveys are conducted. Guest lectures by a NuStats principal or other data expert will be included. Doctoral student Brenda Zhou will likely present on spatial econometric methods. Stay tuned! ☺