GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Branch: Civil Engineering (Transportation Engineering)

Subject Code: ME02069091

Subject Name: Behavioral Travel Modeling

w. e. f. Academic Year:	2024-25
Semester:	2
Category of the Course:	Professional Elective Course

Prerequisite:	Urban Transportation System Planning
Rationale:	This course is important to study for planning of the traffic system management. The commuters' behavior affecting the efficiency of the transportation system. The stated and revealed preference survey data collected from the trip makers is useful in travel demand modeling. The calibration and validation of the mode choice models, model specification and estimation are covered for practical analysis. These behavioral travel models are useful in planning and evaluating the transport improvement projects. These models are also helpful to forecast and examine the sensitivity with respect to change in the key variables.

Program Outcomes

No	Program Outcomes
01	Engage in critical thinking and research to develop solutions to multifold real-world problems.
02	Communicate effectively with the engineering community at large level on complex design tasks & write and present technical reports.
03	Demonstrate a high level of professionalism in handling multidisciplinary and complex engineering problems.
04	Plan, assess, create, integrate, carry out, and oversee complex engineering projects in a sustainable local and global context.
05	Address societal issues by offering technologically advanced, reasonably priced solutions while upholding high standards of ethics and professionalism.

Course Outcome:

After Completion of the Course, Student will be able to:

No	Course Outcomes	RBT Level
01	Develop an understanding of travel surveys and their critical role in transportation planning.	R, U
02	Understand information about various behavioral models.	A
03	Comprehend the theoretical framework and random utility theory that form the foundation of discrete choice models.	A, N

04	Perform statistical estimation and sample validation. Formulate the mode choice model from SP/RP survey.	E, C

**Revised Bloom's Taxonomy (RBT)*

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
3	0	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Survey design and analysis: Travel surveys and their role in transport planning, survey methods, precision and accuracy in travel surveys, sample design, sampling procedures, survey format, pilot surveys, survey administration, collection of stated and revealed preference data, survey data processing.	8	10%
2.	Discrete Choice Models: The multinomial logit model (MNL), Properties of MNL, The hierarchical logit model (HL), Correlation and model structure, The multinomial probit model, Choice by elimination and satisfaction, Habit and hysteresis. Specification and Estimation of Discrete Choice Models, Choice-set determination, Choice-set size, Choice-set formation, Specification and functional form, Statistical estimation, Validation samples, Modeling with stated-preference data.	15	35%
3.	Advanced concepts: accommodating unobserved population heterogeneity in choice behavior, mixed logit models, joint stated preference and revealed preference modeling, and longitudinal choice analysis, Discrete choice models for integrated land use and transport modeling, review of state-of-the-art and future directions.	12	35%
4.	Model Aggregation and Transferability: Aggregate bias and forecasting, Aggregation Methods, Methods to evaluate model transferability, Updating with disaggregate data, Updating with aggregate data.	10	20%
	Total	**45**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
20	**30**	**20**	**10**	**20**	**--**

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. Ortuzar, J. D. and Willumsen, L.G., Modelling Transport, John Wiley & Sons, New York, 1996.
2. Domencich, T.A. and McFadden, D., Urban Travel Demand: A
3. Behavioral Analysis, North-Holland, 1975.
4. Ben-Akiva, M. and Lerman, S, Discrete Choice Analysis: Theory and Application to Travel Demand, MIT Press, 1985.
5. Oppenheim, N., Urban Travel Demand Modeling: From Individual Choices to General Equilibrium, John Wiley, 1995.
6. Borsch Supan Axel , Econometric analysis of discrete choice, Springer-Verlag, Berlin, 1987.
7. Richardson, Ampt, and Meyburg, Survey Methods for Transport Planning, Eucalyptus Press, 1995.

(b) Online resource material on website:

1. https://www.civil.iitb.ac.in/~kvkrao/uploads/5/9/3/7/59372049/ce780_1.pdf

(c) Suggested Practical and Tutorial List:

1. Problems based on selected papers from journals such as Transportation Research, Transportation Science, and Transportation Research Record.
2. Design of survey format (questionnaire) to conduct the stated and revealed preference survey
3. Collection of SP and RP data
4. Analysis of collected SP and RP data and formulate the mode choice model
5. Problems based on discrete choice models
6. Problems based on statistical validation of samples.

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