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Birla Institute of Technology & Science, Pilani
Hyderabad Campus

ACADEMIC – GRADUATE STUDIES AND RESEARCH DIVISION
BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI-HYDERABAD CAMPUS
FIRST SEMESTER 2021-2022
Course Handout Part II

Date: 12/08/2021

In addition to part I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No.: CE G565

Course Title: Transportation Planning

Instructor-in-charge: Prasanta Sahu (prasanta.sahu@hyderabad.bits-pilani.ac.in)
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Description : Basic concepts in transportation planning, accessibility and mobility, land use interaction, government role in transportation planning, characteristics of travel and transport problems; transportation survey and data collection: planning, design and implementation, travel analysis zone (TAZ) development, traditional four-step modelling process; analysis of travel behaviour and demand: studying travel behaviour, analysing urban travel markets; innovations in transportation modelling: travel behaviour model, activity-based models, econometric modelling using rstudio, modelling travel demand with cube, transportation demand management (TDM), transportation system management (TSM), smart city transportation planning: transit-oriented development (TOD),pedestrian-oriented development, liveable street planning, multimodal transportation planning, shared mobility concepts, integrated transportation management and planning, transportation and energy, climate change, fuel choice and green mobility

1. Scope and objectives of the course:

Scope: This course aims to provide a comprehensive scientific insight of transportation system planning in general, associated modelling techniques and relevant applications in specific. The course aims to provide students with an in-depth theoretical understanding of typical four-stage sequential transportation planning. It also incorporates the concepts of transportation system management and accessibility and mobility considerations in transportation planning.

Course Outcome: At the end of this course, the students are expected to develop ability to:

1. Develop an understanding of transportation planning to measure transportation demand.
2. Design various travel behavior surveys to collect transportation planning related data and analyze the data for calibration and validation of various types of models involved in traditional four-step travel demand forecasting process.
3. Develop in-depth knowledge on the classic four stage demand models including: 1) trip generation, 2) trip distribution, 3) mode choice, and 4) trip assignment.
4. Able to understand econometric models and use statistical packages
5. Learn the concepts of sustainable transportation planning and land-use transport

Student Learning Outcomes (SLOs) assessed in this course – **(a), (b), (c), (e), (h), (i), (j),** and **(k).**

2. Textbook(s):

Text Book (TB)

- **T1:** Sarkar, P.K., Maitri, V., and Joshi, G.J. Transportation Planning, Principles, Practices and Policies, PHI Pvt. Ltd., 2016
- **T2:** Papacosta, C.S., and Prevedouros Transportation Engineering and Planning, PHI Pvt. Ltd.,2004

Reference Books (RB)

- **R1:** De Dios Ortuzar, J., and Willumsen, L. G. Modelling transport. John Wiley & Sons., 2011
- **R2:** Hutchinson B.G; Principles of Urban Transport Systems Planning; McGraw-Hill Book Company, 1974.
- **R3:** Chakroborty, P. and Das, A. Principles of Transportation Engineering, PHI Pvt. Ltd., 2012
- **R4:** Train, K. E. Discrete choice methods with simulation. Cambridge university press, 2009
- **R5:** Kadiyali, L. R. Traffic Engineering and Transport Planning, Khanna Publishers, 2015

Lecture wise Course Plan

Lecture No.	Topics Covered	Learning objectives	Reference to TB, RB	SLO*
1	System components of transportation	To study the concepts of system components of transportation	***T1:Ch.1; T2:Ch.7; R1: Ch.1 ; R2: Ch. 1; R3: Ch. 8***	**a, c**
2-4	Basics of Transportation Planning process; Characteristics of transportation problem: Transportation ; transportation demand and supply problem; concept of equilibrium	To understand the basic concepts of Transportation planning with emphasis on transportation demand and supply	***T1: Ch.1 ; ; T2:Ch.7; R1: Ch.1 ; R2: Ch.1 ; R3: Ch. 8 ;***	**a,c,e**
5-6	Introduction to transportation modelling: Revealed and stated-preference models; Aggregate and disaggregate models; Cross-section and time-series models	To learn different types of transportation models; To be able to design Revealed and Stated preference experiments	***T1: Ch.1 ; T2:Ch.7R1: Ch.1 ; R2: Ch.1 ; R3: Ch. 8***	**a,b,j**
7-9	Overview of Traditional Four-Step Travel Demand Forecasting Process; Information needs for travel demand forecasting; Zoning and O-D matrix estimation from traffic surveys	To gain an overview of classic four stage Transportation Planning process; To be able to understand and conduct Origin-Destination studies	***T1: Ch.4 ; T2:Ch.7; R1: Ch.1; R2: Ch.1 ; R3: Ch.8***	**a,c,e**
10-11	Type of data collection methods; Survey instrument design; Sampling procedures	To learn different data collection methods; To design and collect travel behaviour data for real-life transportation problems	***T1: Ch.3 ; R1: Ch.3 ; R2: Ch.1 ; R3: Ch.9 ; R5:Ch.30***	**a,b,j,k**
12-17	Introduction to trip-generation concepts; Factors affecting trip generation; Types of trips; Regression analysis; Linear regression technique and related statistical parameters; Development of regression models from field datasets; Category analysis; Temporal and geographical stability	To be able to develop various trip generation models; To calibrate multiple linear regression equations; To be familiar with econometric and statistical packages such as SPSS	***T1: Ch.5 ; T2:Ch.8; R1: Ch.4 ; R2: Ch.2 ; R3: Ch.9 ; R5:Ch.31***	**a,b,e,j,k**
18-24	Trip distribution models: Growth	To learn and solve	***T1: Ch.6 ; T2:Ch.8;***	**a,b,e,k**

	factor models including Uniform factor method, Average factor method, Fratar method and Furness method; Synthetic methods including Gravity model, Intervening opportunities model and Competing opportunities model	trip distribution models	***R1: Ch.5 ; R2: Ch.4 ; R3: Ch.9 ; R5:Ch.32***	
25-32	Basic modal split models: Trip end and Trip interchange type modal split models: Random Utility theory; Discrete choice modelling framework: Estimation, assumption and specifications of binary, multinomial, mixed and nested Logit and Probit models; Modelling with RP and SP data; Model aggregation and transferability; Introduction and application of N-logit econometric package	To gain knowledge on mode choice models; To understand the mathematical basis behind travel behaviour analysis; To develop Logit models related to Transportation Demand application; To apply N-Logit econometric package for Model estimation	***T1: Ch.7,8 ; T2:Ch.8; R1: Ch. 6, 7, 8 ; R2: Ch.3 ; R3: Ch.9;R4:Ch. 2, 3,6; R5:Ch.34***	**a,b,e,k**
33-39	Basic concepts of assignment; Speed-flow and cost-flow curves; All-or-Nothing assignment; Incremental assignment; Capacity restraint assignment; Stochastic assignment; Stochastic user equilibrium assignment; System optimum assignment and introduction to Dynamic assignment; Shortest path tree building algorithms; Public transport assignments	To learn various trip assignment models for transportation planning; To gain knowledge on different shortest path models; To develop various shortest path algorithms	***T1: Ch.9; T2: Ch.8 ; R1: Ch. 10; R2: Ch.5 ; R3: Ch.9 ; R5:Ch.33***	**a,b,c,e.k**
39-40	Long-term Transport Planning; Accessibility and Mobility considerations	To introduce different transportation systems management measures	***T1: Ch. 11,13***	**c,e,i,j**
41-42	Regional planning models; Land-use Transport models; Transit-Oriented-Development	To learn an in-depth knowledge on sustainable transportation; To know basics of land-use transport planning process and Transit-oriented-Development	***T1: Ch.12,14 ; R5:Ch.36***	**a,f,h,i,j**

***Student Learning Outcomes (SLOs):**

SLOs are outcomes (a) through (k) plus any additional outcomes that may be articulated by the program.

(a) an ability to apply knowledge of mathematics, science and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multidisciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Evaluation Scheme

Ec. No.	Evaluation component	Duration	Weightage	Date, time	Nature of component
1.	Quiz (at least two)	45 Minutes	10%	To be announced in class	OB
2.	Assignments (at least 2)	-	15%	Continuous	OB
3.	Term Paper	-	15%	Continuous	OB
4.	Mid-semester exam	90 Minutes	25%	TBA	OB/CB
5.	Comprehensive Exam	2 Hours	35%	TBA	OB/CB

Office Consultation Hour: To be announced in the class.
Notices: All Notices concerning the course will be displayed on **CMS, Google Classroom and Notice Board** of Civil Engg. Department.
Make up policy: Makeup will be given only to the genuine cases with prior permission.
Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Instructor-in-charge
CE G565