Postgraduate Certificate in Advanced Transport Economics

Advanced Transport Modelling

Transport Modelling is a crucial aspect of Advanced Transport Economics, providing a systematic approach to understanding, analyzing, and predicting transportation systems' behavior and performance. This field encompasses various techniques, methodologies, and tools used to simulate, evaluate, and optimize transportation systems' operations, infrastructure, and policies. In this course, we will explore key terms and vocabulary essential for mastering Advanced Transport Modelling.

1. **Transport Modelling**: Transport Modelling refers to the process of representing, simulating, and analyzing transportation systems to understand their dynamics, interactions, and impacts. It involves creating mathematical and computational models to predict how various factors influence transportation outcomes.

2. **Advanced Transport Economics**: Advanced Transport Economics focuses on applying economic principles and methodologies to analyze transportation systems, policies, and investments. It involves assessing the economic efficiency, equity, and sustainability of transportation projects.

3. **Transportation System**: A Transportation System comprises all the components, modes, and entities involved in moving people, goods, and services from one location to another. It includes infrastructure, vehicles, users, regulations, and supporting services.

4. **Mode Choice**: Mode Choice refers to the decision-making process by which individuals or businesses select a specific transportation mode (e.g., car, bus, train, bike) for their travel needs. Factors influencing mode choice include cost, travel time, comfort, convenience, and accessibility.

5. **Traffic Assignment**: Traffic Assignment is the process of allocating travel demand (e.g., trips) to transportation network links based on the chosen routes and modes. It helps determine traffic flows, congestion levels, and travel patterns within a network.

6. **Network Optimization**: Network Optimization involves maximizing the efficiency and performance of transportation networks by adjusting infrastructure, operations, and policies. It aims to minimize travel times, costs, and environmental impacts while enhancing overall system capacity.

7. **Demand Forecasting**: Demand Forecasting is the process of predicting future travel demand for transportation services based on historical data, demographic trends, economic factors, and policy changes. It helps planners and policymakers make informed decisions about infrastructure investments and service provision.

8. **Simulation Models**: Simulation Models are mathematical and computational representations of transportation systems used to simulate and analyze various scenarios. They help assess the impacts of different policies, technologies, and investments on system performance.

9. **Dynamic Traffic Assignment**: Dynamic Traffic Assignment is a modeling approach that considers the real-time dynamics of traffic flows, congestion, and traveler behavior. It enables the simulation of dynamic traffic conditions and the evaluation of congestion mitigation strategies.

10. **Travel Behavior Analysis**: Travel Behavior Analysis focuses on understanding how individuals make travel decisions, including trip generation, mode choice, route selection, and departure time. It helps predict and influence travel patterns and demand.

11. **Cost-Benefit Analysis**: Cost-Benefit Analysis is a method used to evaluate the economic viability of transportation projects by comparing their costs and benefits over a specified time horizon. It helps quantify the project's impacts on society, the economy, and the environment.

12. **Congestion Pricing**: Congestion Pricing is a policy tool that charges users for using transportation infrastructure during peak periods to reduce congestion, improve traffic flow, and incentivize mode shifts. It aims to internalize the external costs of congestion.

13. **Public Transport Planning**: Public Transport Planning involves designing, optimizing, and managing public transportation services, such as buses, trains, and subways, to provide efficient, affordable, and accessible mobility options for passengers. It includes route planning, scheduling, and fare setting.

14. **Intelligent Transportation Systems (ITS)**: Intelligent Transportation Systems are technologies that use information, communication, and automation to improve transportation safety, efficiency, and sustainability. Examples include traffic signal control systems, real-time traveler information, and automated vehicle technologies.

15. **Environmental Impact Assessment**: Environmental Impact Assessment is a process used to evaluate the potential environmental consequences of transportation projects, such as air and noise pollution, habitat destruction, and carbon emissions. It helps identify and mitigate environmental risks.

16. **Travel Demand Management**: Travel Demand Management comprises strategies and policies aimed at reducing travel demand, shifting travel to off-peak periods or alternative modes, and promoting sustainable transportation choices. It includes telecommuting, carpooling, and pricing incentives.

17. **Accessibility**: Accessibility refers to the ease with which individuals can reach desired destinations or services using various transportation modes. It considers factors such as travel time, cost, distance, infrastructure quality, and mobility options for different population groups.

18. **Freight Transport Modelling**: Freight Transport Modelling focuses on analyzing and optimizing the movement of goods and commodities within transportation networks. It includes freight demand forecasting, modal choice, route optimization, and logistics planning.

19. **Land Use-Transportation Interaction**: Land Use-Transportation Interaction examines the reciprocal relationship between land development patterns and transportation infrastructure. It explores how land use decisions influence travel demand and mode choice, and vice versa.

20. **Microsimulation Models**: Microsimulation Models are detailed, agent-based models that simulate

individual traveler behavior, interactions, and choices within transportation systems. They capture the heterogeneity and dynamics of travel demand at a fine spatial and temporal resolution.

21. **Equilibrium Models**: Equilibrium Models represent transportation systems' stable states where supply and demand are balanced, and no traveler or supplier has an incentive to deviate from their chosen behavior. They help predict system-wide outcomes under different scenarios.

22. **Transport Policy Evaluation**: Transport Policy Evaluation assesses the effectiveness, efficiency, and equity of transportation policies, regulations, and investments in achieving desired objectives. It involves analyzing policy impacts on travel behavior, system performance, and societal welfare.

23. **Discrete Choice Models**: Discrete Choice Models are statistical models used to predict individual decision-making outcomes, such as mode choice, route selection, and destination choice. They consider the trade-offs individuals make among different alternatives based on their preferences and constraints.

24. **Network Equilibrium**: Network Equilibrium refers to the state where travel demand and supply are balanced across all transportation network links, resulting in stable traffic flows and travel times. It represents a point of system-wide congestion and cost minimization.

25. **Transportation Demand Management**: Transportation Demand Management encompasses a set of strategies and measures aimed at reducing travel demand, improving system efficiency, and promoting sustainable transportation choices. It includes pricing, incentives, infrastructure investments, and behavior change programs.

26. **Travel Time Reliability**: Travel Time Reliability measures the consistency and predictability of travel times for transportation users. It reflects the variability and uncertainty in travel times due to congestion, weather conditions, incidents, and other factors.

27. **Stated Preference Surveys**: Stated Preference Surveys are data collection methods used to elicit individuals' preferences, attitudes, and willingness to pay for transportation services and policies. They involve presenting hypothetical scenarios and choices to respondents for evaluation.

28. **Transport Equity**: Transport Equity refers to the fair and equitable distribution of transportation benefits, costs, and access among different population groups. It aims to ensure that transportation systems serve the needs of all users, including disadvantaged and vulnerable communities.

29. **Transport Infrastructure Investment**: Transport Infrastructure Investment involves allocating funds and resources to develop, maintain, and expand transportation infrastructure, such as roads, bridges, public transit, and cycling facilities. It plays a vital role in enhancing mobility, connectivity, and economic development.

30. **Multimodal Transport**: Multimodal Transport combines multiple transportation modes (e.g., walking, cycling, public transit, car-sharing) within a single journey to improve connectivity, flexibility, and efficiency. It offers travelers seamless and integrated mobility options.

31. **Travel Behavior Models**: Travel Behavior Models describe individuals' travel choices, preferences, and

constraints based on socio-economic, demographic, and spatial factors. They help predict travel demand, mode choice, and trip patterns under different scenarios.

32. **Transport Network Design**: Transport Network Design involves planning and optimizing the layout, connectivity, and capacity of transportation networks to facilitate efficient and safe travel. It includes route selection, lane configurations, intersection design, and access management.

33. **Transportation Economics**: Transportation Economics studies the economic principles, market forces, and policy interventions that shape transportation systems' performance, efficiency, and sustainability. It examines supply-demand dynamics, pricing mechanisms, externalities, and regulatory frameworks.

34. **Travel Survey Methods**: Travel Survey Methods are data collection techniques used to gather information on individuals' travel behavior, patterns, and preferences. They include household surveys, GPS tracking, smart card data analysis, and mobile phone tracking.

35. **Freight Demand Forecasting**: Freight Demand Forecasting predicts the future demand for moving goods and commodities within transportation networks. It considers factors such as economic growth, trade patterns, supply chain dynamics, and modal preferences.

36. **Travel Time Value**: Travel Time Value quantifies individuals' willingness to trade off time for money or other benefits when making travel decisions. It helps assess the economic value of travel time savings and guide transportation investment decisions.

37. **Transportation Network Models**: Transportation Network Models represent the spatial layout, connectivity, and operational characteristics of transportation networks using mathematical graphs or GIS databases. They help analyze network performance, congestion, and accessibility.

38. **Transportation Planning**: Transportation Planning involves setting goals, objectives, and strategies to guide the development and management of transportation systems. It includes long-term visioning, policy formulation, investment prioritization, and stakeholder engagement.

39. **Travel Demand Forecasting Models**: Travel Demand Forecasting Models predict future travel patterns, mode choices, and trip generation based on demographic, economic, and land use data. They help inform infrastructure investments, service planning, and policy development.

40. **Transportation Network Analysis**: Transportation Network Analysis examines the structure, capacity, and performance of transportation networks using mathematical, statistical, and computational methods. It helps identify bottlenecks, optimize flows, and improve system efficiency.

41. **Route Choice Models**: Route Choice Models predict how travelers select specific routes within transportation networks based on factors such as travel time, distance, congestion, and preferences. They help understand route switching behavior and traffic distribution.

42. **Transportation Accessibility**: Transportation Accessibility measures individuals' ability to reach desired destinations and services using available transportation modes. It considers physical, financial, and temporal barriers that affect mobility and connectivity for different population groups.

43. **Logistics Modeling**: Logistics Modeling involves analyzing and optimizing the movement, storage, and distribution of goods within supply chains and transportation networks. It includes inventory management, warehouse operations, freight routing, and last-mile delivery.

44. **Travel Cost Models**: Travel Cost Models estimate the monetary and non-monetary costs associated with travel, including fuel expenses, vehicle maintenance, travel time, and environmental impacts. They help assess the affordability and efficiency of transportation options.

45. **Transportation Equity Analysis**: Transportation Equity Analysis evaluates how transportation policies, investments, and services impact different population groups' access, affordability, and quality of transportation. It aims to address disparities and promote inclusive mobility solutions.

46. **Transportation Simulation Tools**: Transportation Simulation Tools are software applications that model and simulate transportation systems' behavior, performance, and impacts. They help planners and policymakers test scenarios, evaluate alternatives, and optimize system operations.

47. **Freight Transport Logistics**: Freight Transport Logistics encompasses the planning, coordination, and execution of logistics operations to move goods efficiently and cost-effectively within supply chains. It includes inventory management, warehousing, packaging, and distribution.

48. **Vehicle Routing Optimization**: Vehicle Routing Optimization aims to find the most efficient routes and schedules for transporting goods or passengers using a fleet of vehicles. It considers factors such as delivery locations, vehicle capacities, time windows, and traffic conditions.

49. **Spatial Interaction Models**: Spatial Interaction Models analyze the flows of people, goods, and information between locations based on their spatial attributes, distances, attractions, and connectivity. They help predict travel patterns, market demand, and land use changes.

50. **Congestion Management Strategies**: Congestion Management Strategies include a range of measures to reduce traffic congestion, such as pricing, lane management, signal coordination, and transit priority. They aim to improve traffic flow, reduce delays, and enhance system efficiency.

In conclusion, mastering the key terms and vocabulary related to Advanced Transport Modelling is essential for understanding the complex dynamics and interactions within transportation systems. By familiarizing yourself with these concepts, you will be better equipped to analyze, model, and optimize transportation networks, policies, and investments in the context of Advanced Transport Economics.