

ESE 554
URBAN TRANSIT SYSTEMS AND TECHNOLOGY
MO – WE 12:00-1:15, 303 Towne Building

Course Outline

<u>T o p i c s</u>	<u>D a t e s</u>
1. History of cities and the role of transport systems in their development - Early development of cities; impacts of transportation on their locations, size and form - The Industrial Revolution and its impacts on urbanization - Growth of cities and development of different transportation technologies and modes in the 19 th and 20 th centuries up to now - Technical inventions in urban transportation and their impacts on cities - Current trends in transportation technology, operations and urban development.	5, 10 Sep.
2. Urban passenger transport modes - Urban transport systems: classification and functions - Definitions of modes: private transport, paratransit and public transit - Theory of evolution of urban passenger transport modes - The family of transit modes; performance/cost characteristics of their categories - Trends in uses of different modes.	12, 17 Sep.
3A. Vehicle motion – traction systems and performance - Vehicle motion: forces of resistance and propulsion - Diesel and electric traction and their performance - Components of vehicle travel and dynamic performance - Acceleration, stopping and spacing distances.	19, 24 Sep.
3B. Travel time computations - Travel time elements - Station-to-station travel motion and time analysis - Energy consumption characteristics of modes.	26 Sep., 1 Oct.
4. Capacity, productivity and efficiency of transit modes - Definitions of quantitative performance attributes - Models of transit vehicle flow - Transit line capacity: critical elements - Theoretical and practical values of capacity - Transit line productivity and efficiency measures and values.	3, 8 Oct.
5A. Highway/road transit modes: characteristics and vehicles - Bus and trolleybus mode characteristics - Vehicles: technical and design features; the "optimal vehicle" concept - Recent developments: guided bus, bimodal and low-floor vehicles;	10 Oct.

"clean diesel", CNG propulsion; hybrid buses.

- 5B. Highway transit modes: ways, terminals, operations** 17, 22 Oct.
- Travel ways for buses and trolleybuses: mixed traffic operation, preferential treatments, busways, guided bus systems (O-Bahn)
 - High occupancy vehicle (HOV) facilities: definition, classification, role and impacts on bus services
 - Stops, stations and garages
 - Operations, performance and costs
 - Bus Rapid Transit - BRT : physical, operational and performance characteristics
 - Intelligent Transportation System (ITS) applications in transit.
- Midterm Examination** (tentative) **24 Oct.**
- 6A. Rail transit modes: characteristics and vehicles** 29, 31 Oct.
- The family of rail transit modes: streetcar/tramway, light rail, metro (rapid transit) and regional (commuter) rail
 - Rolling stock description; double- and single-axle trucks, standard and articulated designs, uni- and bi-directional vehicles, standard and low-floor LRVs, etc.
 - Analysis and comparison of technical and operating characteristics of rail vehicles.
- 6B. Rail transit modes: rights-of-way, stations, operations** 5, 7 Nov.
- Rights-of-way: types and characteristics
 - Track installations; tunneling techniques
 - Rubber-tired metro
 - Stops, stations and yards
 - Operations, performance and costs
 - Automation of Metro systems
 - Future roles of different rail transit modes; LRT/Metro and LRT/RGR systems.
- 7. Unconventional system/technology modes and concepts** 12 Nov.
- Early and present monorails
 - Initial and present definitions of AGT, APM and PRT
 - Magnetic levitation (Maglev) trains
 - Description and evaluation of AGT and APM systems: Airtrans, Westinghouse, VAL, Vancouver Skytrain, Docklands and other ALRT systems
 - **Automation and its impact on conventional and new modes.**
- 8. Specialized modes and technologies** 14 Nov.
- Short-haul transportation, shuttles
 - Terrain-specialized technologies: cog railways, funiculars, aerial tramways, ferryboats, hydrofoils.
- 9. Paratransit** 19 Nov.

- Definition and classification
- Semipublic and public modes: carpooling, vanpooling, taxis, dial-a-ride, commuter transit
- Evaluation of paratransit. its roles in developed and developing countries
- Positive and negative impacts of privatization.

Field trip (tentative) 21 Nov.

10. Characteristics and Comparisons of Transit Modes 26, 28 Nov.

- Methodology of mode comparison; different modal characteristics
- Comparisons of medium- and high-performance modes, focusing on BRT, LRT, AGT and Metro.

Guest speaker 3 Dec.

11. Case studies: Bay Area Rapid Transit System, Washington Metrorail, Mexico City, LRT and BRT 5 Dec.

Final examination: ?? December

Course requirements

Lectures, several homework problem sets, term paper, midterm and final examinations.

Term paper deadlines

Term paper: Proposal 24 Sep.; Approval 8 Oct.; Progress report 19 Nov; Report 3 Dec.

Course grading

Problem sets 25%	Midterm examination 20%
Term paper 25%	Final examination 30%

Course text

1. Vukan R. Vuchic, 2007, **Urban Transit Systems and Technology**, John Wiley & Sons, Hoboken, NJ.
2. Additional bibliography, references and materials will be given.

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