CEE 4612 – HIGHWAY AND TRAFFIC ENGINEERING

2019 ACADEMIC YEAR SEMESTER 2

Lecturer:	Office Hours:	Email:
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Lectures: 4 Hours Per Week	Mondays	: 08:00 - 10:00 Hrs
	Fridays	: 10:00 - 12:00 Hrs
Labs: 3 Hours Per Week	Tuesdays	: 14:00 - 17:00 Hrs

TOPIC 1

Introduction

General Introduction

Transportation Engineering

- It is the application of technology and scientific principles to planning, functional design, operation and management of facilities for any mode of transportation in order to provide for the safe, rapid, comfortable, convenient, economical and environmentally compatible movement of people and goods.
- Transportation is concerned with the movement of goods and people from one location to another
- It is essential for any nation's development and growth
- Need for a strong transportation system arises mainly from economic needs but is also strongly related to military purposes and personal fulfillment
- Strong empires and world powers across the history have always been associated with good transportation systems
- However, improvement of transportation systems comes at economic, social, and environmental price which include:
  - Consumption of land and resources
  - Loss of lives in accidents
  - Disturbance of wild-life habitat
  - Pollution and noise

Modes of Transport

Mode	Typical Function	Approximate Range of Capacities*
Urban People Transportation Systems		
Automobile	Private personal transportation; available on demand for all trips.	1–6 persons/vehicle; approx. 2,000 veh/h per freeway lane; 400–700 veh/h per arterial lane.
Taxi/For-hire vehicles	Private or shared personal transportation, available by prearrangement or on call.	1–6 persons/vehicle; total capacity limited by availability.
Local bus transit	Public transportation along fixed routes on a fixed schedule; low speed with many stops.	40–70 persons/bus; capacity limited by schedule; usually 100–5,000 persons/h/route.
Express bus transit	Public transportation along fixed routes on a fixed schedule; higher speed with few intermediate stops.	40–50 persons/bus (no standees); capacity limited by schedule.
Para-transit	Public transportation with flexible routing and schedules, usually available on call.	Variable seating capacity depends on vehicle design; total capacity depends on number of available vehicles.
Light Rail	Rail service using one- to two-car units along fixed routes with fixed schedules.	80–120 persons/car; up to 15,000 persons/h/route.
Heavy Rail	Heavy rail vehicles in multicar trains along fixed routes with fixed schedules on fully separated rights-of-way in tunnels, on elevated structures, or on the surface.	150–300 persons/car depending on seating configuration and standees; up to 60,000 persons per track.
Ferry	Waterborne public transportation for people and vehicles along fixed routes on fixed schedules.	Highly variable with ferry and terminal design and schedule.

Modes of Transport

Intercity People Transportation Systems		
Automobile	Private transportation available on demand for all trip purposes.	Same as urban automobile.
Intercity bus	Public transportation along a fixed intercity route on a fixed (and usually limited) schedule. Provides service to a central terminal location in each city.	40–50 passengers per bus; schedules highly variable.
Railroad	Passenger intercity rail service on fixed routes on a fixed (and usually limited) schedule. Provides service to a central terminal location or locations within each city.	500–1,000 passengers per train, depending on configuration; schedules highly variable.
Air	A variety of air-passenger services from small commuter planes to jumbo jets on fixed routes and fixed schedules.	From 3–4 passengers to 500 passengers per aircraft depending on size and configuration. Schedules depend on destination and are highly variable.
Water	Passenger ship service often associated with onboard vacation packages on fixed routes and schedules.	Ship capacity highly variable from several hundred to 3,500 passengers; schedules often extremely limited.

*Ranges cited represent typical values, not the full range of possibilities.

Modes of Transport

Mode	Typical Function	Approximate Range of Capacities*
Urban and Intercity Freight Transportation Systems		
Long-haul trucks	Single, double, and triple tractor-trailer combinations and large single-unit trucks provide over-the-road intercity service, by arrangement.	Hauling capacity of all freight modes varies widely with the design of the vehicle (or pipeline) and limitations on fleet size and schedule availability.
Local trucks	Smaller trucks provide distribution of goods and services throughout urban areas.	
Railroad	Intercity haulage of bulk commodities with some local distribution to locations with rail sidings.	
Water	International and intercity haulage of bulk commodities on a variety of container ships and barges.	
Air freight	International and intercity haulage of small and moderately sized parcels and/or time-sensitive and/or high-value commodities where high cost is not a disincentive.	
Pipelines	Continuous flow of fluid or gaseous commodities; intercity and local distribution networks possible.	

*Ranges cited represent typical values, not the full range of possibilities.

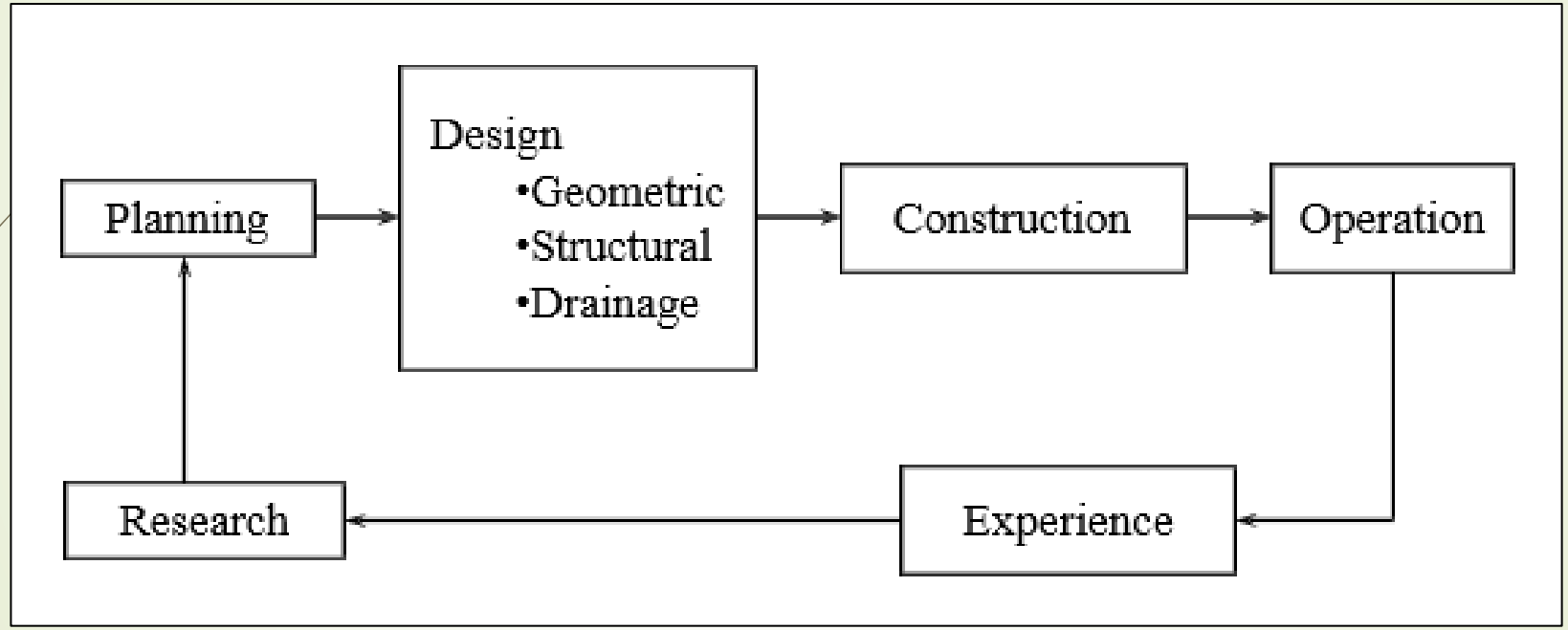
General Introduction

Traffic Engineering

- It is concerned with safety of the public, the efficient use of transportation resources, and the mobility of people and goods by road modes including non-motorized modes.
- Traffic Engineering is the phase of transportation engineering that deals with the planning, geometric design and traffic operations of roads, streets and highways, their networks, terminals, abutting lands, and relationship with other modes of transportation
- A transportation system exists to move people and goods, to enable economic activity, and to provide for public needs
- All functions of society depend upon the transportation system

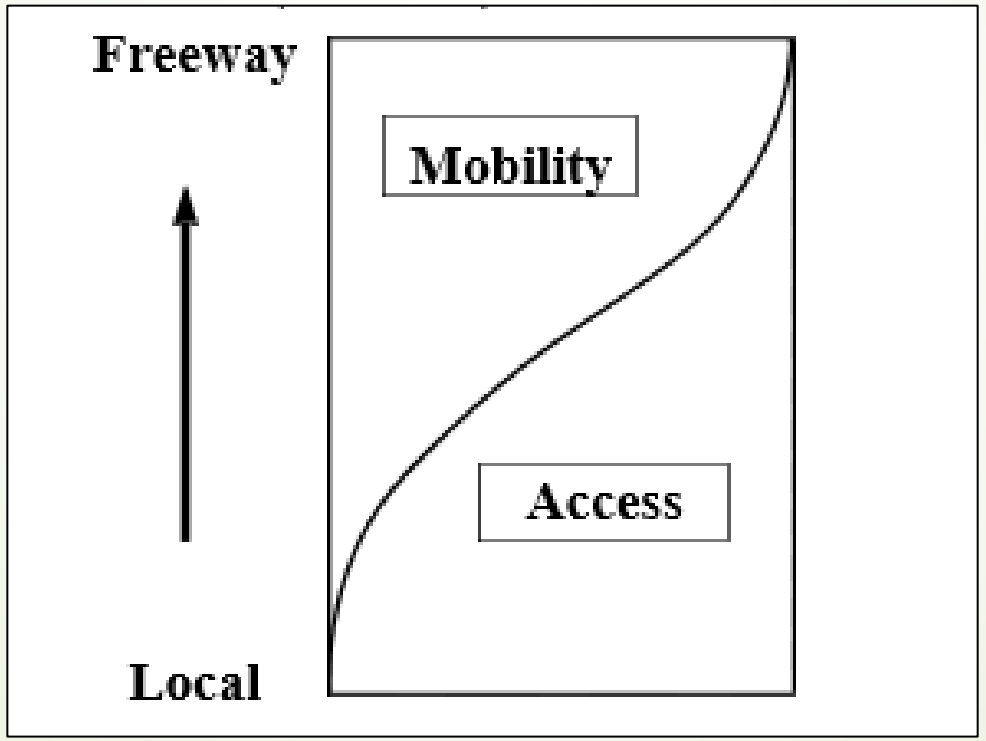
General Introduction

- Opportunities for engineering careers in transportation include:



Highway Network

- Highway systems provide two fundamental functions:
  - Movement between various types of human activities (MOBILITY)
  - Movement access to various types of human activities (ACCESS)



Highway Network

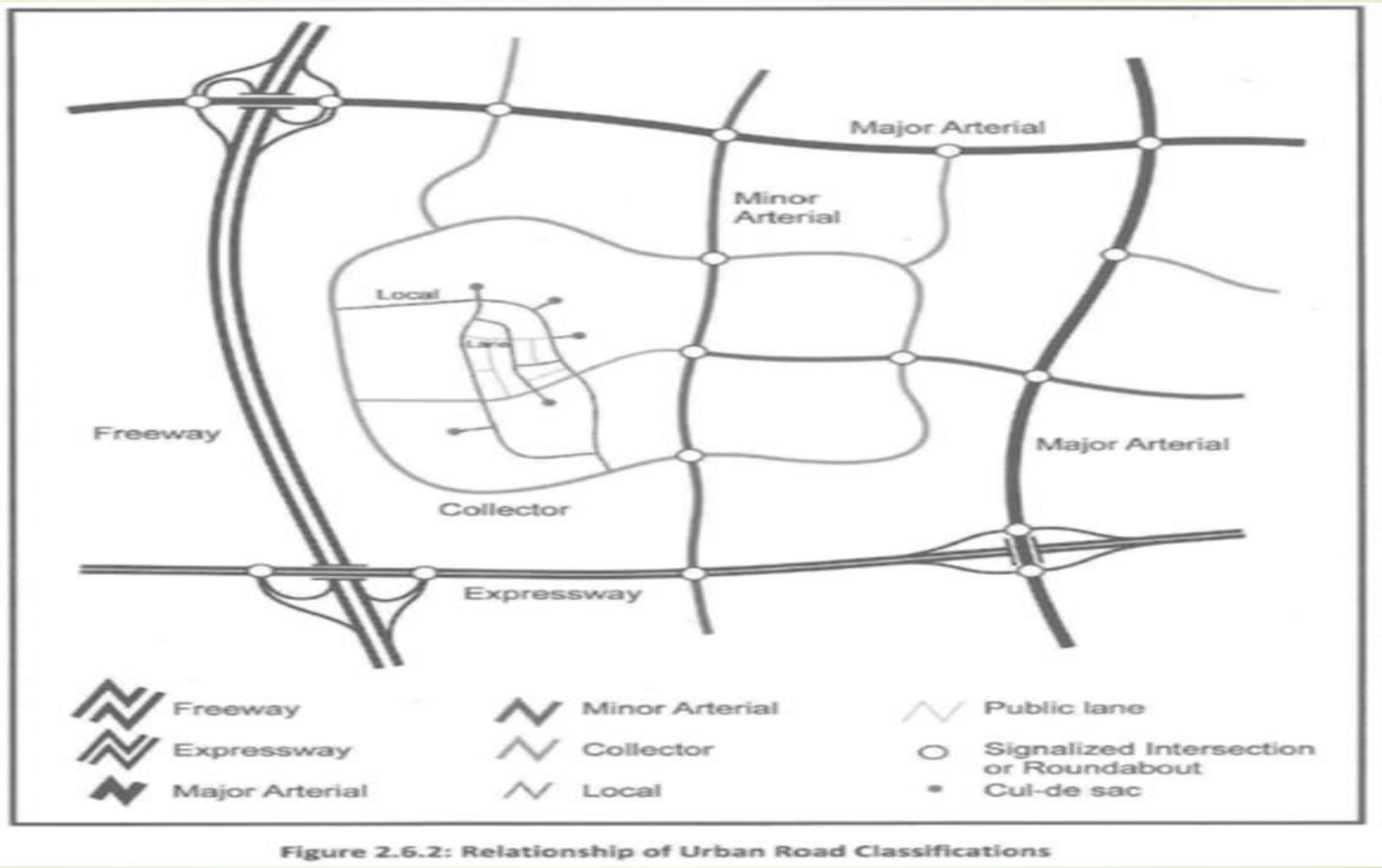


Figure 2.6.2: Relationship of Urban Road Classifications

Connection by Classification

Groups	Normally Connects With					
	Public Lane	Local	Collector	Arterial	Expressway	Freeway
Public Lane	Y	Y				
Local	Y	Y	Y			
Collector		Y	Y	Y		
Arterial			Y	Y	Y	Y
Expressway				Y	Y	Y
Freeway				Y	Y	Y

Road Classification Systems

- Road Classification is the orderly grouping of roads into systems according to the type and degree of service they provide to the public
- Many classification systems have been developed
- Can be based on:
  1. Location (rural or urban)
  2. Road service
  3. Design speed
  4. Divided or undivided

Public Lanes

- Urban areas only
- Land access is the only function

Road Classifications Systems

Local Streets

- To provide land access
- Have "Stop", "Yield", or signalized controls
- Connect other locals and collector streets
- Account for about 70% of the total length of urban streets

Collector Streets

- Provide both traffic service and land access
- Connect between local and arterial streets
- Design yearly traffic volume: 1,000 to 12,000 vpd
- Have more than 2 lanes and can be divided

Arterial Streets

- Carry large volumes of traffic moving at medium to high speeds
- Serve the major traffic flows between the principal traffic generators and connect between collectors and freeways
- Design yearly traffic volume: 5,000 to 30,000 vpd
- May have interchanges

Road Classifications Systems

Urban Expressways

- Class for urban roads only
- Uninterrupted flow except at signals
- Speeds ≥ 80 km/h

Urban Freeways

- Serve heavy traffic volumes moving at high speeds
- Free-flow conditions (grade separated)
- Serve as urban extension to principal rural highways
- Yearly traffic volume > 20,000 vpd
- Speeds ≥ 80 km/h

Rural Freeways

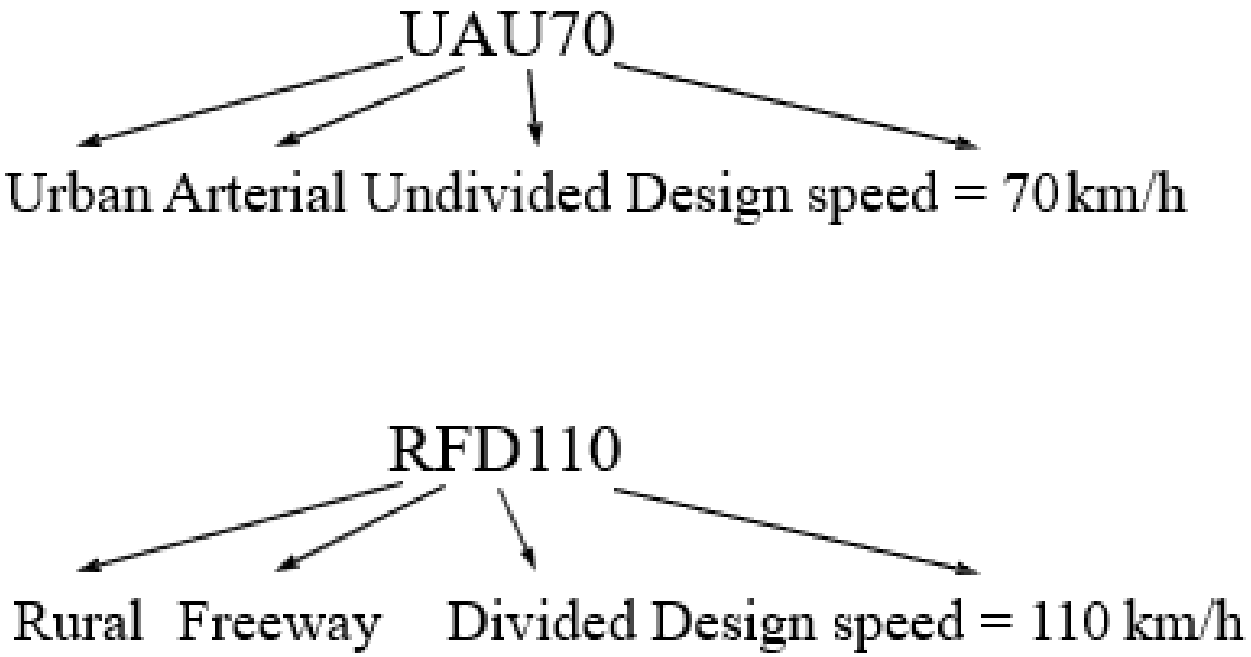
- Connect between cities
- Serve heavy traffic volumes at high speed
- Free flow condition

Road Classification Systems

- Due to location:
  - Urban → U
  - Rural → R
- Due to class:
  - Lane (urban only)
  - Local → L
  - Collector → C
  - Arterial → A
  - Expressway → E (urban only)
  - Freeway → F
- Due to type:
  - Divided → D
  - Undivided → U
- Due to quality:
  - Design Speed → xxx km/h

Road Classification Systems

Example:



Thank You!!!