Slide 1:

Blue title slide with a picture of a skyscraper.
Title: LEAFS Civil Spring 2021
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Slide 2:
Title: Ice breaker:

Why would an engineer need to be in the traffic sector?

Slide 3:
Title: Imagine a group of people trying to make music together without a conductor.

1 person stays on a steady beat, normal volume.
1 person makes a beep that is off beat, loudly.
1 person sings but their volume changes from silent to loud.
1 person whispers 911 every so often.
What would this situation be like?

Slide 4:

Just like a musical group needs its conductor to organize the song, highways and intersections need to be designed carefully by civil engineers.

Slide 5:
Title: What is traffic engineering?

Image: a bird's eye view of a busy highway at night.

Slide 6:
Title: Traffic Engineering.

Traffic engineers/transportation planners design and plan road systems
They ensure the roads are safe and efficient
They work with roads, parking lots, and traffic signs.

Image 1: asphalt street with two yellow lines to separate lanes.

Image 2: empty parking lot.

Image 3: yellow diamond sign with walking and biking stick figures on it.

Slide 7:
Title: What do traffic engineers do?

Traffic counting surveys.
Determining proper signs and pavement markings.
Investigating transport-related accidents to improve safety.
Analyzing effects of nearby/roadside construction.

Slide 8:
Title: Adventures of a traffic engineer.

Image: picture of busy highway ramps at night.

Slide 9:
Title: Congratulations!

You were hired as a civil engineer by the city of Oz! You will be specializing in traffic engineering. Your first task is to drive around the city and make sure everything is up to code.

Image: a picture of a yellow brick road cutting through a field of grass and flowers and leads to a faraway city of green buildings.

Slide 10:
Title: Safety edge.

You start your drive on a newly paved road. As the car ahead of you begins to turn, you notice that it drifts to the side and may soon take a steep drop off of the roadway!
Using your quick thinking, you realize a safety edge needs to be put in.

Slide 11:
Title: What is a safety edge?

A safety edge is a design strategy that shapes the edge of the road to prevent drivers from dangerously falling off the roadway.

Left Image: A picture of a car driving on the road with a slanted curb and black markers next to grass.

Right Image: A close-up view of a paved safety edge next to grass.

Slide 12:
Title: Safety Edge.

What should the angle of the safety edge be? Click an option to continue.

Left Image: A diagram showing a road with curb arrow angled upwards for a safety edge of 30 degrees up.

Center Image: A diagram showing a road with curb arrow pointing down, for a safety edge of 90 degrees.

Right Image: A diagram showing a road with curb arrow angled downwards for a safety edge of 30 degrees down.

Slide 13:
Title: Safety Edge - Up 30 degrees.

Image: A diagram showing a road with curb arrow angled upwards for a safety edge of 30 degrees up.

Not quite! An upward angle raises the highway edge and actually *increases* the danger of the car running off the edge. This is the opposite of what we want! Try again!

Slide 14:
Title: Safety Edge - 90 Degrees.

Image: A diagram showing a road with curb arrow pointing down, for a safety edge of 90 degrees.

Not quite! When drivers steer off the road, a vertical drop-off can make it difficult for the driver to re-enter the lane. This can lead to the driver losing control and crashing the vehicle. Try again!

Slide 15:
Title: Safety Edge - 30 Degrees down.

Left Image: A diagram showing a road with curb arrow angled downwards for a safety edge of 30 degrees down.

Right Image: A paved road with safety edge. A hand and foot are used with a yellow tape measure to show the angle of the safety edge.

Correct! The safety edge should be sloped down 30 degrees. This number was the research tested value to be the best at providing a durable and gradual transition for vehicles, especially when they turn to get back onto the road safely. Click here to continue.

Slide 16:
Title: Freeway Lanes.

You hop on the freeway at a safe 65mph, but soon the surrounding land area narrows down from 4 to 2 lanes. How was this decided?

Image: Four freeway divides, each with passing cars in multiple freeway lanes.

Slide 17:
Title: Solving Freeway Lanes.

You are given a value of 1700 vehicles per hour per lane (vphpl) as a basis for 2 lanes. If 3,233 vehicles are expected for peak hour traffic, how many freeway lanes are needed?

Given: Peak Hour Volume = **3,233** vehicles/hr; Vphpl = **1700**
Solution: Number of Lanes = PeakHourVolume divided by vphpl = 3,233 / 1700 = 1.90 Lanes or about 2 lanes.

Image: An overhead view of a multipass freeway system.

Slide 18:
Title: Hairpin turn in the mountains.

You soon come to a nice highway drive and are enjoying the view. But a sharp turn is coming

up! Is it safely made?
A hairpin bend is located on a hill section that has very little slope and maximum stability.

Image: Side view of a road's sharp turn in the mountains.

Slide 19:
Title: Hairpin turn in the mountains.

Is the safest driving speed 15mph, 20mph, or 25mph?
The smallest curve radius should be: 10m, 15m, or 20m?
What should the driving length be to transition from the curve to a straight road: 10m, 15m, or 20m? 15 mph, 15m, 15m

Image: 2D sketch of a curved road labelling the transition length and circular curve.

Slide 20:
Title: Construction Roadblock.

Phew! You finally made it out of the mountains and now find yourself driving along the Yellow Brick Road to the great Emerald City of Oz. But before you can get there, the Good Witch and her munchkins stop you to ask for advice in setting up a construction site to build a fun-house next to the road.

Images from Left to Right: Cartoon of the Good Witch holding a stop sign; cartoon of a crane building a house; purple munchkin man; the Yellow Brick Road in Munchkinland.
Slide 21
Title: Construction Roadblock

In what order would you suggest the Good Witch's engineers create for safely constructing the road that leads to their Funhouse?

A. Notify public of construction
B. Create an emergency traffic plan
C. Notify city officials of construction
D. Calculate and enforce the necessary pace setting of traffic using speed message boards and/or police/construction pacers
E. Meet with construction team, law enforcement, and utilities

Slide 22
Title: Construction Roadblock

Priority Ranking:
A. Create an emergency traffic plan
B. Meet with construction team, law enforcement, and utilities
C. Notify city officials of construction (2wks in advance)
D. Notify public of construction(1wk in advance)
E. Calculate and enforce the necessary pace setting of traffic using speed message boards and/or police/construction pacers

Slide 23
Title: Intersections

You have finally arrived at the gates of the city and parked in the lot to check it out. As you walk around, you notice some familiar intersection features from your traffic studies.

Image: A very busy intersection in chaos, with pedestrians, bikers, and vehicles all in disorder and crowded in the center.

Slide 24
Title: Intersection Components: What is it?

What do you think each item is used for?

Image: (Left) A zoom up of a sidewalk ramp with a bright yellow bumpy surface. (Top right) A place between two roads with two yellow markers and a sidewalk. (Bottom right) A sidewalk ramp onto a main road.

Slide 25
Title: Intersection Components

Which crosswalk curb would you choose to install?

Image: (A) A sidewalk ramp that has yellow bumps and only extends perpendicularly but not as a semicircle. (B) A sidewalk ramp that does not have yellow bumps but is shaped like a semicircle.

Slide 26
Title: Intersection Components: Truncated Domes

- "Warning Dome" to physically warn of entering a roadway
    - Aids the visually impaired
- Bright, contrasting color to help those with limited eyesight

Image: A sidewalk ramp that has an edge of yellow small bumps.

Slide 27
Title: Intersection Components

Which crosswalk cub would you choose to install?

Image: (A) A crosswalk that leads to a sidewalk that starts with a curb and a narrow path. (B) A sidewalk that leads to a sidewalk ramp with the edge of yellow small bumps and a wide entrance.

Slide 28
Title: Components: Curb Ramps

- For wheelchair and limited-mobility pedestrians

- Must be minimum 3ft wide, no more than 2% slope

Image: A sidewalk ramp that is shaped like a semicircle and has two exits with squares of yellow

bumps.

Slide 29
Title: Intersection Components

What are the differences between side A and side B?

Image: An image where the A and B side are mirrored with both sides having truncated domes, a median refuge island, and striped white lanes.

Slide 30
Title: Intersection Components: Median Refuge Islands

Image: Same image as before.

Slide 31
Title: Intersection Components: Median Refuge Islands

They are easier to cross roadways by focusing on one section at a time. Includes warning domes and widths to have two wheelchairs side by side.

Image: A median refuge island. It is a cement island in between two opposite direction roads that allow passengers to cross one direction at a time.

Slide 32
Title: Time to Return Home, Engineer!

As you return to your car and travel through to the city limits, the Great and Powerful Oz certifies you as a qualified engineer! You successfully exit the city and return on your way back home.

Image: The Wizard of Oz waving.

Slide 33
Title: Great Job!

Image: A car driving away at dusk.

Slide 34
Title: Inclusive Design

What is it and how do we apply it?

Slide 35
Title: Integrating Inclusive Design

What do you think inclusive design means? Think about who, what, where, and why?

Slide 36
Title: Integrating Inclusive Design

The British Standards Institute (2005) defines inclusive design as: ‘The design of mainstream products and/or services that are accessible to, and usable by, as many people as reasonably possible ... without the need for special adaptation or specialised design.’ (University of Cambridge)

Slide 37

Title: Tenets of Inclusive Design

Equitable: Design that provides an equal experience and level of quality and dignity for everyone.

Proactive: Design that is not merely reactionary or regulatory.

Intuitive: Design that feels natural and easy to use.

Flexible: Design that gives choice to the user.

Image: A pie chart split equally in four ways. Each slice the the first letter of each tenet.

Slide 38

Title: Intersection Components: Brainstorm Challenge

How would you design a traffic light to help colorblind pedestrians?

Image: (Top) A stoplight with red, yellow, and green lights. (Bottom) A stoplight with all yellow lights.

Slide 39

Title: Example: Wheelchair Ramps

Do you see any problems with the ramps in the images below? How would you redesign these?

Image: (Left) A ramp with excessive ninety degree turns. (Right) A ramp with the center cutout, making it easy for wheelchair users and other pedestrians to fall through.

Slide 40

Title: Example: Your own Life!

Can you think of an example of encountering non-inclusive design from your own life?

What was uncomfortable or inconvenient?

What would you have improved?

What's an example of inclusive design you have encountered?

Physical and online?

Slide 41

Title: Example: Your Own Life!

What would you improve? How would you redesign it?

Draw / write your ideas here!

Slide 42

Title: Activity: Design a Street

https://streetmix.net/-/1310519

What does your ideal street look like?

Some things to consider: How wide is the sidewalk? What type of signs or signals would there be? Are there businesses, parks, nature around? Who will be using the street? Consider: old people, children, people with physical disabilities, bikers, cars, buses.