CECE Progress Report
14 April 2021

Integration and next steps of Common Engineering Core

Major Assumptions

- Common Yr1 and Common Engineering Core used interchangeably in CECE internal planning documents.
- Four (4) core areas:
  - A-Z of engineering (ENGR 1100)
  - Nature Inspired Principles (ENGR 1320)
  - Computational Thinking (ENGR 1330)
  - Socio-Technological Aspects (ENGR 2392)

Downstream Course Mapping

- Downstream mapping of courses where these core principles can be integrated:
  - CIVE
  - CONE
  - ENGR

Downstream Programming Worksheet

Notes: Updated 2020-1204; Moved CE 4361 to Spring Year 3, renumber as CE 3361; Moved Pols 2306 from Spring Year 3 to Fall Year 4; no net change in credit hours total, no net change credit hours each impacted semester

	Year 1					Year 2					Year 3					Year 4				
	Fall		Spring		Summer	Fall		Spring		Summer	Fall		Spring		Summer	Fall		Spring		Summer
MATH	Math 1451	4	Math 1452	4		Math 2450	4	Math 3550	3											
								IE 3341 or Math 3342	3											
18																				
SCIENCE	Chem 1307/1107	4	Chem 1308/1108	4		Phys 1408	4											Basic Science	3	
15																				
ENGINEERING	ENGR 1110 (EZ)	1	ENGR 1320 (BID)	3		CE 2301 (BID/CT)	3	CE 3303 (BID/CT)	3		CE 3309/3171 (BID)	4	CE 3372 (CT/BID/ST)	3		CE 4200 (ST)	2	CE 4330 (ST)	3	
	ENGR 2392 (ST)	3	ENGR 1330 (BID/ST	3		CONE 2302 (CT/ST	3	CE 3305 (CT)	3		CE 3354 (CT/BID/ST)	3	CE 3341 (BID)	3		CE 4343 (BID)	3			
	EGR 1207	2						IE 2324	3		CE 3440 (BID/CT)	4	CE 3302 (CT/BID/ST)	3		CE 43XX	3	CE 43XX	3	
								CE 2201 (BID)	2		CE 3103	1	CE 3321/3121 (BID/ST)	4						
											CE 3105	1	CE 3361 (CT/BID)	3						
72																				
CORE CURRICULUM	Engl 1301	3	Engl 1302	3		Pols 1301	3				Hist 2300	3				Coms 2300	3	Hist 2301	3	
																Pols 2306	3	Arts/Multi	3	
24																				
INTL EXPERIENCE																				
OTHER																				
0																				
Credit Hours		17		17			17		17			16		16			14		15	
Total Hours		129																		

Downstream Common 1st Year

4 major Themes — Identify a single "problem" with increasing complexity/depth/focus to revisit multiple courses building upon added knowledge;

EZ - explore A to Z — it would be a homework/team project of some significance in each identified class

ST- social technical — The lead theme is identified with support themes.

BID - biological inspired design — For example biological inspired design, selects a shape in a structural class, computational thinking provides network analysis (a network of strucutral members), social technical identifies risks/ acceptance

CT - computational thinking

Downstream Programming Worksheet

	Year 1					Year 2					Year 3					Year 4				
	Fall		Spring		Summer	Fall		Spring		Summer	Fall		Spring		Summer	Fall		Spring		Summer
MATH	Math 1451	4	Math 1452	4		Math 2450	4	Math 3550	3				Math 3342	3						
18																				
SCIENCE	Chem 1307/1107	4	Phys 1408	4		Geol 1303/1103 or Biol 1305/1113	4													
12																				
ENGINEERING	ENGR 1110 (EZ)	1	ENGR 1320 (BID)	3		CE 2301 (BID/CT)	3	CE 3303 (BID/CT)	3		CE 3321	3	CONE 3300 (CT/ST)	3		CONE 4100 (ST)	1	CONE 4220 (ST/CT)	2	
	ENGR 2392 (ST)	3	EGR 1207	2		CONE 2302 (CT/ST)	3	CE 3305 (CT)	3		~~CE 3121~~		CONE 3302 (CT/ST)	3		CONE 4310 (BID/CT)	3	CONE 4324 (ST)	3	
	ENGR 1330 (CT)	3	CONE 1100 (ST)	1		CE 2201 (BID)	2	~~CONE 2300~~			CONE 3310 (BID/CT)	3	CONE 4300 (CT/ST)	3		CONE 3304 (BID/ST/CT)	3	CONE 4312 (BID/CT)	3	
								CONE 2200 (ST)	2		CONE 4320 (CT/ST)	3	CONE 4322 (ST)	3				CONE 4331 (Finance)(ST/CT)	3	
											IE 2324	3						ECE 3301	3	
74																				
CORE CURRICULUM	Engl 1301	3	Engl 1302	3				Hist 2300	3		Pols 1301	3				Hist 2301	3	Arts/Multi	3	
								Coms 2300	3							Pols 2306	3			
24																				
INTL EXPERIENCE																				
OTHER																~~EGR/BUSINESS Elec~~				
0																				
Credit Hours	18		17			16		17			15		15			13		17		
Total Hours	128																			

Downstream Common 1st Year

4 major Themes
EZ - explore A to Z
ST- social technical
BID - biological inspired design
CT - computational thinking

Identify a single "problem" with increasing complexity/depth/focus to revisit multiple courses building upon added knowledge; it would be a homework/team project of some significance in each identified class
The lead theme is identified with support themes.
For example biological inspired design, selects a shape in a structural class, computational thinking provides network analysis (a network of strucutral members), social technical identifies risks/ acceptance

Downstream Programming Worksheet

	Year 1					Year 2					Year 3					Year 4					Year 5				
	Fall		Spring		Summer	Fall		Spring		Summer	Fall		Spring		Summer	Fall		Spring		Summer	Fall		Spring		Summer
MATH	Math 1451	4	Math 1452	4		Math 2450	4				Math 3342 or IE 3341	3	Math 3550	3											
18																									
SCIENCE	Chem 1307/1107	4	Chem 1308/1108	4		Phys 1408	4	Env. Sci Elec	3																
						Chem 3305	3																		
22						Biol 1402	4																		
ENGINEERING	EGR 1207	2	ENGR 2392 (ST)	3		CE 2301 (BID/CT)	3	CE 3305 (CT)	3		CE 3303 (BID/CT)	3	CE 3321	3		CE 4353	3	CE 5363	3		ENVE 5315	3	~~CE 5102~~		
	ENGR 1320 (BID)	3	ENGR 1330 (CT)	3							CE 3354 (CT)	3	CE 3372 (CT/BID)	3		ENVE 4107	1	ENVE 4391	3		ENVE 5305	3	CE 5395	3	
	ENGR 1110 (EZ)	1	ENVE 1100	1							CE 3171	1	IE 2324	3		ENVE 4307	3	ENVE 4399	3		Tech. Elective	3	ENVE 5306	3	
											ENVE 3301 (BID)	3	ENVE 3302	3		ENVE 4385/4185	4	ENVE 5303	3		Tech. Elective	3	Tech. Elective	3	
													CE 3105 (CT)	1				ENVE 4191	1				Tech. Elective	3	
90																									
CORE CURRICULUM	Engl 1301	3	Engl 1302	3				Pols 1301	3		Pols 2306	3				Arts/Multi	3	Hist 2301	3						
								Hist 2300	3																
								Coms 2300	3																
24																									
INTL EXPERIENCE																					INTL EXP				
OTHER																									
0																									
Credit Hours	17		18			18		15			16		16			14		16			12		12		
Total Hours	154																								

Downstream Common 1st Year

Sacrifice CE 5102 to maintain total hour count and meet organizational mandates

4 major Themes
EZ - explore A to Z
ST- social technical
BID - biological inspired design
CT - computational thinking

Identify a single "problem" with increasing complexity/depth/focus to revisit multiple courses building upon added knowledge; it would be a homework/team project of some significance in each identified class
The lead theme is identified with support themes.
For example biological inspired design, selects a shape in a structural class, computational thinking provides network analysis (a network of strucutral members), social technical identifies risks/ acceptance

Implementation

- Exploring Several Implementation Concepts
  - Example Problem Library (partial examples)
  - Case Study Approach
    - Identified several large scale projects that are elaborate enough to require all major aspects in CIVE (structures, fluid mechanics, geotechnical engineering, environmental engineering, data management, ethics, sociological interactions, nature inspired/compatable)
  - A JIT skill-development library (no examples yet – just an idea)

How to make an ordinary homework problem into a computational thinking exercise - Fluid Mechanics

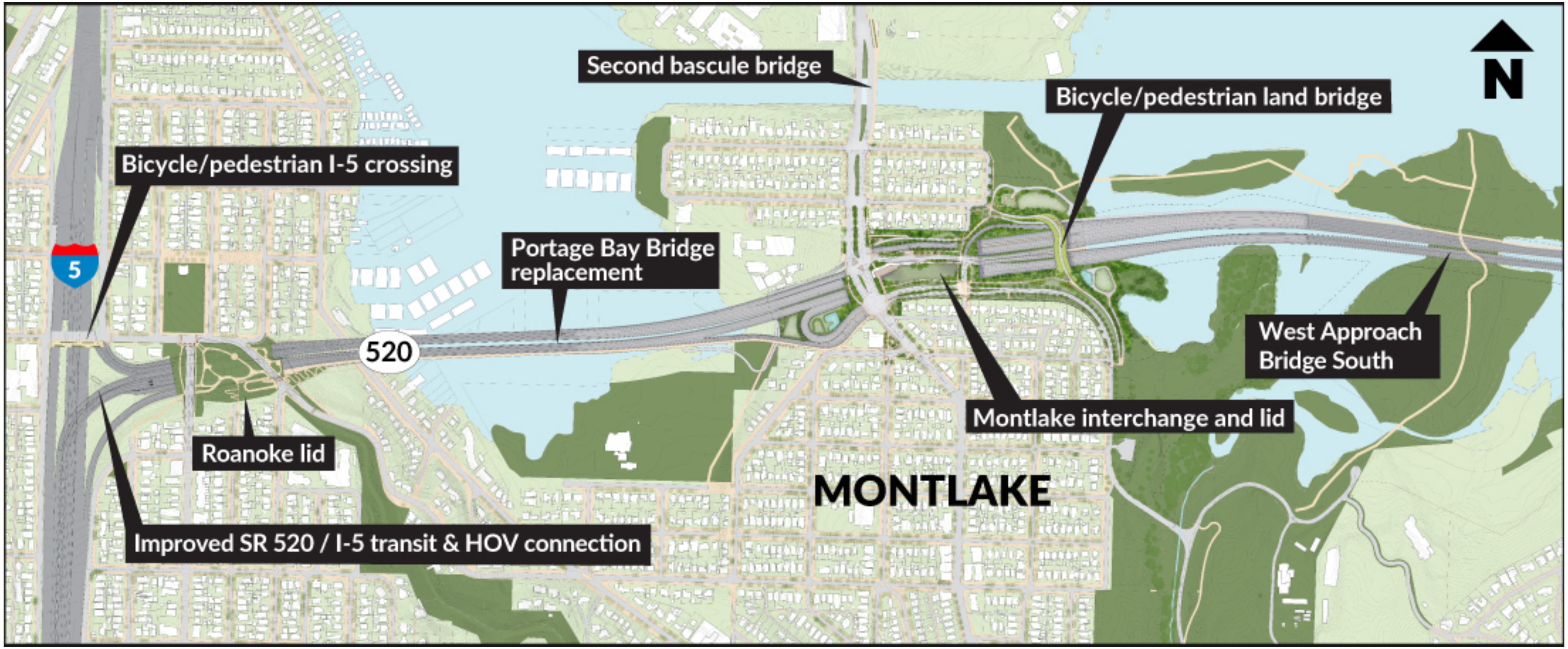
Prerequesites (for this example)

- Students will have completed ENGR-1330; CE 2301; and be enrolled in CE 3305
- Students (by virtue of ENGR-1330) will have functioning implementations of JupyterLab

Methodology for Problem (and Solution)

- Present problem verbatim from usual source, i.e. textbook
- Review main principles of CT :
  1. Algorithm - A list of steps that you can follow to finish a task
  2. Decomposition - Break a problem down into smaller pieces
  3. Abstraction - Pulling out specific differences to make one solution work for multiple problems
  4. Pattern Matching - Finding similarities between things
- CT Problem Solving Protocol (from ENGR-1330)
  1. Explicitly state the problem
  2. State:
  3. Input information
  4. Governing equations or principles, and
  5. The required output information.
  6. Work a sample problem by-hand for testing the general solution.
  7. Develop a general solution method (coding).
  8. Test the general solution against the by-hand example, then apply to the real problem.
- Start the problem/solution example; explicitly identify CT principles as problem proceedes.

Portage Bay Project - Seattle



Alaskan Way Viaduct

From Wikipedia, the free encyclopedia

Route map:

This article is about the former viaduct. For its replacement, see Alaskan Way Viaduct replacement tunnel.

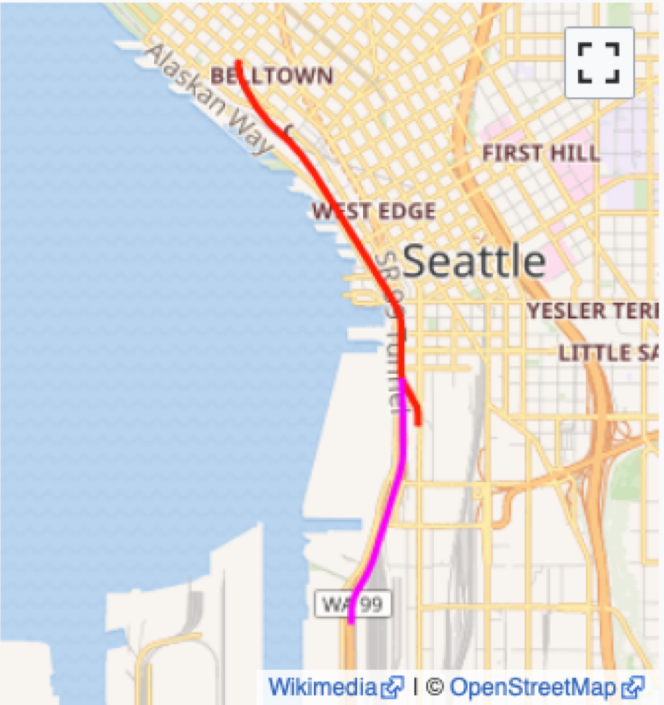
The **Alaskan Way Viaduct** ("the viaduct" for short)[1][2][3] was an elevated freeway in Seattle, Washington, United States, that carried a section of State Route 99 (SR 99). The double-decked freeway ran north–south along the city's waterfront for 2.2 miles (3.5 km), east of Alaskan Way and Elliott Bay, and traveled between the West Seattle Freeway in SoDo and the Battery Street Tunnel in Belltown.

The viaduct was built in three phases from 1949 through 1959, with the first section opening on April 4, 1953. It was the smaller of the two major north–south traffic corridors through Seattle (the other being Interstate 5), carrying up to 91,000 vehicles per day in 2016.[4] The viaduct ran above Alaskan Way, a surface street, from S. Nevada Street in the south to the entrance of Belltown's Battery Street Tunnel in the north, following previously existing railroad lines.

The viaduct had long been viewed as a barrier between downtown and the city's waterfront, with proposals to replace it as early as the 1960s. Questions of the structure's seismic vulnerability were raised after several earthquakes damaged similar freeways in other cities, including some with the same design as the viaduct. During the 2001 Nisqually earthquake, the Alaskan Way Viaduct suffered minor damage but later inspections found it to be vulnerable to total collapse in the event of another major earthquake, necessitating its replacement.

The state and city governments considered several options, including a rebuilt elevated structure, a surface boulevard, and cut-and-cover tunnel, but could not compromise on a final choice. A deep-bored tunnel was selected in 2009 and the southern section of the viaduct was demolished in 2011 and replaced with a six-lane, single-deck freeway that travels through the SoDo industrial area.[5] Excavation of the downtown bored tunnel by the tunnel boring machine "Bertha" began in 2013 and was completed in 2017 after two years of delays. The viaduct was closed permanently on January 11, 2019, and the new tunnel opened three weeks later on February 4.[6][7] Demolition of the viaduct began weeks later, and was complete by late 2019.

Alaskan Way Viaduct



A map of Downtown Seattle with the Alaskan Way Viaduct highlighted in red and older demolished sections highlighted in pink

Planning for Near Future

- Example Problem Library is closest to being deployable
  - Create example(s) for faculty to use as an extended homework exercise; these seem readily adaptable for CTDS, and BID
- Relevant literature articles that can employed for ST
- Case Study (by parts) is longer term activity, but have identified a couple projects we can examine that use all 4 core areas in some fashion, and they either have real-time data, or we can get useful data to weave into the curriculum in progressively elaborate depth.