

Engineering FEST-2 – Civil Engineering & Environmental Engineering Programs

Overview

Engineering FEST-2 will cover both Mechanical Engineering and Civil and Environmental Engineering programs. For the Civil Engineering and Environmental Engineering programs, this part of the festival is divided into four sessions and a panel discussion. The Panel Discussion, “Skills Needed for the Real World”, will include two CENE and two ME alumni and is geared for undergraduate engineering students of all levels. CENE Capstone projects support the following workforce development areas: Water Resources (flood control and hydrologic modeling, stream restoration, water treatment operations, wastewater treatment operations), Environmental Remediation (abandoned mine site investigation and remediation, hazardous waste treatment operations design) and Infrastructure (structural and geotechnical design such as bridges and buildings, traffic analysis, highway design, multimodal transportation). Both CENE 476 (Capstone Prep) and CENE 486C (Capstone Design)

Schedule

The schedule for the Civil Engineering and Environmental Engineering portion includes the following four sessions: CENE 476 Capstone Prep Oral Presentations Morning Sessions 1 and 2, CENE 486C Capstone Oral Presentations Morning Session 3 and Afternoon Session 1. Those schedules can be found below. Abstracts detailing each presentation are found after the Schedule.

Morning Session #1 – 7:30AM - 8:45AM (duBois Center, Aspen A)

CENE 476 Capstone Prep Presentations

Moderator: Dr. Diana Calvo, Assistant Professor, Environmental Engineering

Welcome, Intros: 7:30-7:40AM

Project Title	Time Start	Time End
City of Flagstaff-Shadow Mountain Drainage Design	7:40AM	7:53AM
PCI Big Beam Competition	7:53AM	8:06AM
City of Flagstaff-Fanning Wash @ Linda Vista Drainage Design	8:06AM	8:19AM
Prochnow Auditorium Rigging Analysis	8:19AM	8:32AM
Mother Road Brewery Wastewater Treatment Design	8:32AM	8:45AM

Morning Session #2 – 8:55AM – 10:05AM (duBois Center, Aspen A)

CENE 476 Capstone Prep Presentations

Moderator: Emily Henderson, Graduate Teaching Assistant, Environmental Engineering

Project Title	Time Start	Time End
BLM Canyon City Mill PA/SI	8:55AM	9:08AM
Concrete Canoe Competition	9:08AM	9:21AM
Steel Bridget Competition	9:21AM	9:34AM
City of Flagstaff-West St Wash Drainage Design	9:34AM	9:47AM
Joy Cone Wastewater Treatment Design	9:47AM	10:05AM

Morning Session #3 – 10:15AM – 11:55AM (duBois Center, Aspen A)

CENE 486C Capstone Presentations

Moderator: Dr. Brendan Russo, Associate Professor, Civil Engineering

Project Title	Time Start	Time End
BLM Tailings Solidification Research	10:15AM	10:40AM
City of Flagstaff-Bar Screen Design	10:40AM	11:05AM
City of Flagstaff-Navajo Rd Improvements Design	11:05AM	11:30AM
Dewey Septic Design	11:30AM	11:55AM

Lunch Break – 11:55AM – 1:00PM (on your own)

Panel Discussion – 1:00PM-2:00PM (duBois Center, Aspen B/C)

Moderators: Dr. Paul Gremillion (Professor and Chair, Department of Civil Engineering, Construction Management and Environmental Engineering), and Dr. Armin Eilaghi (Assistant Teaching Professor, Mechanical Engineering)

Topic: “Skills Needed for the Real World”, will include two CENE and two ME alumni and is geared for undergraduate engineering students of all levels.

Panelists:

- CENE: Julie Leid - Peak Engineering
- CENE: Stephen Irwin - SWI
- ME: Beau Wilson – W. L. Gore & Associates
- ME: Ashley Jerome – InterLink Engineering LLC

Afternoon Session #1 – 1:00PM – 2:15PM (duBois Center, Aspen A)

CENE 486C Capstone Presentations

Moderator: Dr. Joshua Hewes, Associate Professor, Civil Engineering

This session occurs during the Panel Discussion.

Project Title	Time Start	Time End
Rio de Flag Channel Design	1:00PM	1:25PM
Dewey Site Design	1:25PM	1:50PM
Purina Retaining Wall Design	1:50PM	2:15PM

Project Details

Below are the project titles, team members’ names and contact emails, and short abstracts for each project. All project websites can be found by following the QR code to the right. Websites are expected to be fully operational by December 13, 2022.



[CENE 476 Projects:](#)

[City of Flagstaff Shadow Mountain Drainage Design](#)

This project, sponsored by the City of Flagstaff, involves the design of hydrologic control structures to prevent/reduce flooding to the Shadow Mountain neighborhood of Flagstaff that is affected by post-fire flooding on Elden Mountain. The project includes determination of 100-year flood scenario flows given the degraded topology, topographic mapping, modeling flows for various design scenarios, selecting the best alternative, and fully designing the structures, such as terraces, fans, channels, basins and inlets/outlets. Team members:

Jones, Carleigh Marie Cmj335@nau.edu
Whitehorse, Shanya D Sdw264@nau.edu
Wilson, Sydney Rochelle Srw373@nau.edu

[PCI Big Beam Competition](#)

This annual student competition is sponsored by the Precast Concrete Institute and involves the design and construction of a 20' reinforced concrete beam. Reinforcement consists of steel rebar, and the orientation of the reinforcement. The beam is cast by TPAC in Phoenix and delivered to NAU where it is tested in a massive device nicknamed "The Hulk" where it is stressed until it breaks. Students must predict the deflection, cracking strength and failure strength of the beam. Team members:

Eschen, Anthony Martin Ame353@nau.edu
McCormick, Hunter Paul Hpm32@nau.edu
Sewell, Joshua Nathaniel Jns384@nau.edu
Young, Farrah Leleioaiga Fly3@nau.edu

[City of Flagstaff-Fanning Wash @ Linda Vista Drainage Design](#)

This project, sponsored by the City of Flagstaff, involves the design of hydrologic control structures to prevent/reduce flooding and to manage stormwater flows in East Flagstaff in the areas of Linda Vista/Fanning Road area to Rte 66. This area is affected by increased flows due to post-fire flooding on Elden Mountain. The project includes determination of 100-year flood scenario flows given the degraded topology, topographic mapping, modeling flows for various design scenarios, selecting the best alternative, and fully designing the structures, such as culverts, channels, basins and inlets/outlets. Team members:

Jauregui, Maria Fernanda mfj37@nau.edu
Joshi, Sneha sj765@nau.edu
Smith, Caleb Daniel cds523@nau.edu

[Prochnow Auditorium Rigging Analysis](#)

The Prochnow Auditorium at NAU provides a venue for a variety of performances. The ceiling support structures must provide support for mobile production walls/scenery, curtains, as well as aerial acts. NAU requested an analysis of the rigging to ascertain the exact structural support within the required margin of safety. The project will include mapping of all beams and supporting structures, modeling loads and making recommendations for upgrades. Team members:

Ajungo, Amy Aa3998@nau.edu
Espinoza, Jose Alejandro Jae343@nau.edu
Portillo-Wightman, Justin Jrp498@nau.edu
Quax, Theodore Kenwood Tkq5@nau.edu

[Mother Road Brewery Wastewater Treatment Design](#)

The Mother Road Brewery in Flagstaff strives for the best in sustainable processes, recycling most of their brewery waste. Brewery wastes typically have elevated levels of nitrogen and biological oxygen demand, and Mother Road is seeking additional treatment in order to be well below City of Flagstaff permit requirements. This project will require the team to combine novel pollutant removal technologies into various designs, modeling their performance using various software programs, and designing the selected alternative for the brewery footprint. Team members:

Helm, Serenity Grace Sgh85@nau.edu
Kennedy, Daniel Brian Dbk44@nau.edu
Murphy, Alexander Denis Adm528@nau.edu

BLM Canyon City Mill PA/SI

A Preliminary Assessment/Site Investigation is a part of the Superfund process under the CERCLA Act. This project involves an abandoned mill in northwestern Arizona; historic processes included milling and heap leaching to recover precious metals from ores from surrounding mines. These processes resulted in widespread contamination of public lands. This Bureau of Land Management (BLM) project involves developing a project Work Plan, soil sampling, analytical testing of the soils, identifying the primary contaminants (often lead and arsenic), developing maps showing the spatial extent and degree of contamination, and performing human health and ecological risk assessments based upon various uses of the public lands. Team members:

Blackhurst, Chloe Ann Cab847@nau.edu
Downs, Evan James Ejd234@nau.edu
Griffiths, Claire Jean Cjf445@nau.edu
Martinez, Frankie Irene Fim23@nau.edu

Concrete Canoe Competition

This annual student competition is sponsored by the American Society of Civil Engineers (ASCE). The students must fully design a concrete canoe and race in at the competition. The design includes selection of concrete type, reinforcement options and selection, selection of hull design, hull analysis (modeling with structural design software), creating a mold, pouring the concrete/adding the reinforcement, curing the canoe, and learning to race a concrete canoe with 2- and 4-person teams. This project is time intensive but a lot of fun, meeting students from other universities for a 4-day conference. Team members:

Hritz, Anne Marie Amh2233@nau.edu
Leazier, Matthew MI2777@nau.edu
Napier, Brendon Tyler Btn47@nau.edu
Timosko, Mason Alec Mat468@nau.edu
Wing, Victor Kenneth Vkw9@nau.edu

Steel Bridge Competition

This annual student competition is sponsored by the American Society of Civil Engineers (ASCE) and American Institute of Steel Construction (AISC). The students must fully design a scale model of a steel bridge and test it at the competition. The design includes selection of bridge type, bridge analysis (modeling with structural design software), creating all the bridge components (welded or bolted connections), and building the bridge. The competition scores the time to build the bridge as well as whether it can hold the lateral and vertical deflections when weight is placed upon it. This project is time intensive but a lot of fun, meeting students from other universities for a 4-day conference. Team members:

Chiquito, Justin Paul Jpc262@nau.edu
Dover, James Mitchell Jmd848@nau.edu
Gonzalez, Jessica Jg2947@nau.edu
Pierce, Gregory David Gdp38@nau.edu

City of Flagstaff-West St Wash Drainage Design

This project, sponsored by the City of Flagstaff, involves the design of hydrologic control structures to prevent/reduce flooding and to manage stormwater flows in East Flagstaff in the area from Coconino High School to Rte 66. This area is affected by increased flows due to post-fire flooding on Elden Mountain. The project includes determination of 100-year flood scenario flows given the degraded topology, topographic mapping, modeling flows for various design scenarios, selecting the best alternative, and fully designing the structures, such as culverts, channels, basins and inlets/outlets. Team members:

Ketchum, Kolten Farrell K fk36@nau.edu
Purne, Mikael Dimitri Mdp288@nau.edu
Shinnar, Omar oms35@nau.edu

Joy Cone Wastewater Treatment Design

The Joy Cone Company in Flagstaff manufacture ice cream cones. Wastewater treatment from the cooking processes typically have elevated levels of nitrogen and biological oxygen demand. Joy Cone currently discharges wastewater to the City of Flagstaff sewer. The Joy Cone Company is seeking a novel and alternative treatment for these wastes. This project will require the team to evaluate the surrounding terrain to identify hydrologic options for on-site treatment, combine novel pollutant removal technologies into various designs, and design the selected alternative for the site footprint. Team members:

Eisenach, Megan Marie Mme232@nau.edu
Haneysmith, Rachael Z Rzh4@nau.edu
LeBlanc, Gabrielle Marie Gml96@nau.edu
Sandhu, Gabriella Mary Gms292@nau.edu

CENE 486C Projects:

BLM Solidification Research

This research project involves pilot testing mine tailings from two Bureau of Land Management (BLM) abandoned mine/mill sites in northwestern Arizona, the Pilgrim Mine and the Arizona Magma Mine. Ore processing “tailings” from these sites contain very elevated levels of lead and arsenic. One technology to stabilize these contaminants is solidification – turning sandy tailings into solid materials that no longer present a migration hazard to the environment. This project involves testing two solidification binder materials (cement and cement/lime) at three different mixing ratios to determine whether the solidified materials pass compressive strength and leaching tests. Lab work involves mixing the tailings with the binders to create cementitious, solidified samples, testing them in a compressive strength device, and mixing the crushed materials with acids to simulate acid rain (the leaching test). If the solidified samples pass the leaching test, they are then considered non-hazardous. This research will inform the BLM as to site-specific solidification options for these two contaminated sites. Team members:

Ashley Blackwell alb844@nau.edu
Monica Encinas me793@nau.edu
Matthew Jonas anj235@nau.edu
Ashley Ryland amr2335@nau.edu

City of Flagstaff – Bar Screen Design

This research project involves designing an effective bar screen to prevent clogging in storm drains. The City of Flagstaff is sponsoring this team. The team will build a flume to test flow regimes with various bar screen alternative designs, ascertain the best option, and scale up the selected alternative for the determined Flagstaff flows. Team members:

William Robert Arrington wra29@nau.edu
Maddison Klingberg mk647@nau.edu
Diego Medina dm2464@nau.edu
Samuel Turner sit7@nau.edu

City of Flagstaff – Navajo Rd Improvements Design

This project involves a redesign of the Navajo Rd in Flagstaff to incorporate sidewalks and meet Americans with Disabilities Act requirements. The team, using topographic and hydrologic data, will develop a design that incorporates new sidewalks, curbing able to manage high stormwater flows while minimizing impacts to homeowners’ driveway access. All aspects of the design must meet City of Flagstaff codes. Team members:

Jacob Fisher jaf472@nau.edu
Riley Kane rsk45@nau.edu

Carmine Russo cr2456@nau.edu
Eli Pinedo eap294@nau.edu

Dewey Septic Design

The project is sponsored by a property owner in Dewey, AZ, and involves the design of a septic system capable of providing greywater for irrigation as well as sanitary sewerage functions. Septic design must not only meet city/county codes, but also consider topography, soil conditions and dwelling size. Team members:

Gillian Arnold gaa96@nau.edu
Henri Bozarth hjb85@nau.edu
Ronald Carter rlc367@nau.edu
Cooper Crenshaw ctc96@nau.edu

Rio de Flag Channel Design

The main goal of this project is to design a healthy channel and mitigate channel aggradation from sediment traveling from the Flagstaff Museum fire burn scar area. The project is located at the conjunction of Rio de Flag Channel and Spruce Wash, where there is recreational use from the Flagstaff Urban Trail System (FUTS). Team members:

Paston Omeally pk06@nau.edu
Bingze Weng bw653@nau.edu
Mia Perla mmp384@nau.edu
Myron Bryant mjb668@nau.edu

Dewey Site Design

The project is sponsored by a property owner in Dewey, AZ. A site design involves engineering the entire property so that appropriate hydrologic conditions occur with the new development at the site, so that soil erosion is minimized, and no negative impacts occur on downgradient properties. The team must analyze 100-year rainfall data, topography, and soil conditions to identify the best layout for development of the site. Team members:

Danielle Tom dt59@nau.edu
Daniel Langsmith dpl54@nau.edu
Lanceford Quoskuyva lwq2@nau.edu
Kewei Ren rk479@nau.edu

Purina Retaining Wall Design

This project involves the design of a retaining wall that is required to support a new access road at the Purina Facility in Flagstaff. The new access road will cut through an undeveloped area of the property, and requires cuts up to 20' deep. Therefore, retaining walls must be designed to support these cuts. Retaining wall design requires selection and analysis of the wall material and internal reinforcement, and factor of safety analysis against sliding, overturning and subsidence. Additionally, runoff from rain events must be considered, and design of water management structures to handle incipient rain as well as percolation through the wall itself. The full design requires determination of soil cut/fill that results in a cost effective wall. Team members:

Tyler Derzay tld332@nau.edu
Tiffany May McCremens tdm284@nau.edu
Tattwankshi Kanojiya tsk57@nau.edu
Joshua Sewell jns384@nau.edu