CIEG 467/667 Stream Hydropower Seminar (3 cr.)

Classroom

Spring 2025 T/Th 9:35-10:55 am
Room Colburn Lab Rm 102

Instructor

Gerald Joseph McAdams Kauffman, Jr., Ph.D.
Director, Delaware Water Resources Center
Associate Professor, Biden School of Public Policy & Administration
Department of Civil, Environmental, and Construction Engineering
University of Delaware
DGS Annex 261 Academy St.
Newark, DE 19716
cell: 302-893-8605 jerryk@udel.edu www.wrc.udel.edu

Course Description

Students will study the fundamentals of low head hydropower as a source of clean energy, fish passage, and river restoration at small mill dams along the Brandywine River, Christina River, Red Clay Creek, and White Clay Creek in and near Newark and Wilmington, Delaware. This course will employ civil/environmental, mechanical, and electrical engineering principles to estimate hydropower hydraulic/energy potential, fish passage viability, and design low head hydro turbines at mill dams along the three streams. This course will employ an interdisciplinary engineering approach based on river hydraulics, energy/power/electricity production, and fisheries/ecological restoration principles in a field that has the potential to provide clean renewable energy while restoring the river environment.

Text

Campbell, R. W., 2010. Small Hydro and Low-Head Hydro Power Technologies and Prospects. Congressional Research Service. 15 pp. https://crsreports.congress.gov/product/pdf/r/r41089/5

National Hydropower Association www.hydro.org

DOE Hydropower Basics www.energy.gov/eere/water/hydropower-basics#

Hydropower

Schedule

Week of:

Feb 4-6, 2025 - Introduction to Low Head Hydropower

Feb 11-13 – Watershed framework of the Brandywine, Red Clay, White Clay Creek systems

Feb 18-20 – River and low head dam hydraulics

Feb 25-27 – Field survey/inventory of low head hydro dams

Mar 4-6 – Low head hydro hydraulic potential

Mar 11-13 – Hydropower energy potential

Mar 18-20– Fish passage hydraulics

Mar 25-27 – Spring break

Apr 1-3 – Low head hydro dam field inspection (mid term exam)

Apr 8-10 – Hydroelectric feasibility and design – Brandywine River

Apr 15-17 - Hydroelectric feasibility and design – Red Clay Creek

Apr 22-24 - Hydroelectric feasibility and design – White Clay Creek

Apr 29-May 1 – Low head hydro plans, specifications, and cost estimates

May 6-8 – Low head hydro design semester report

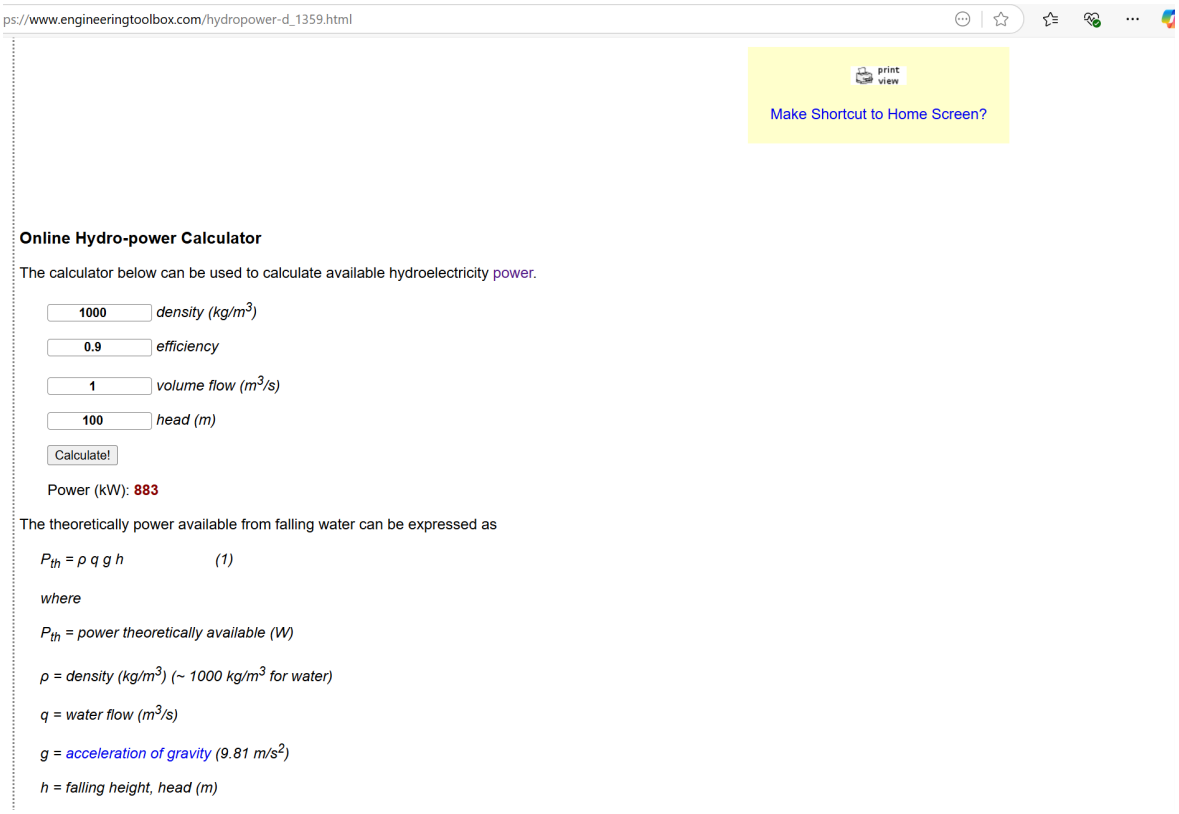
May 13-15 – Low head hydro class presentations

May 20, 2025 – Field exam

Grading

Participation	10%
Attendance	10%
Midterm exam	20%
Final Exam	20%
Semester report	20%
Class presentation	20%

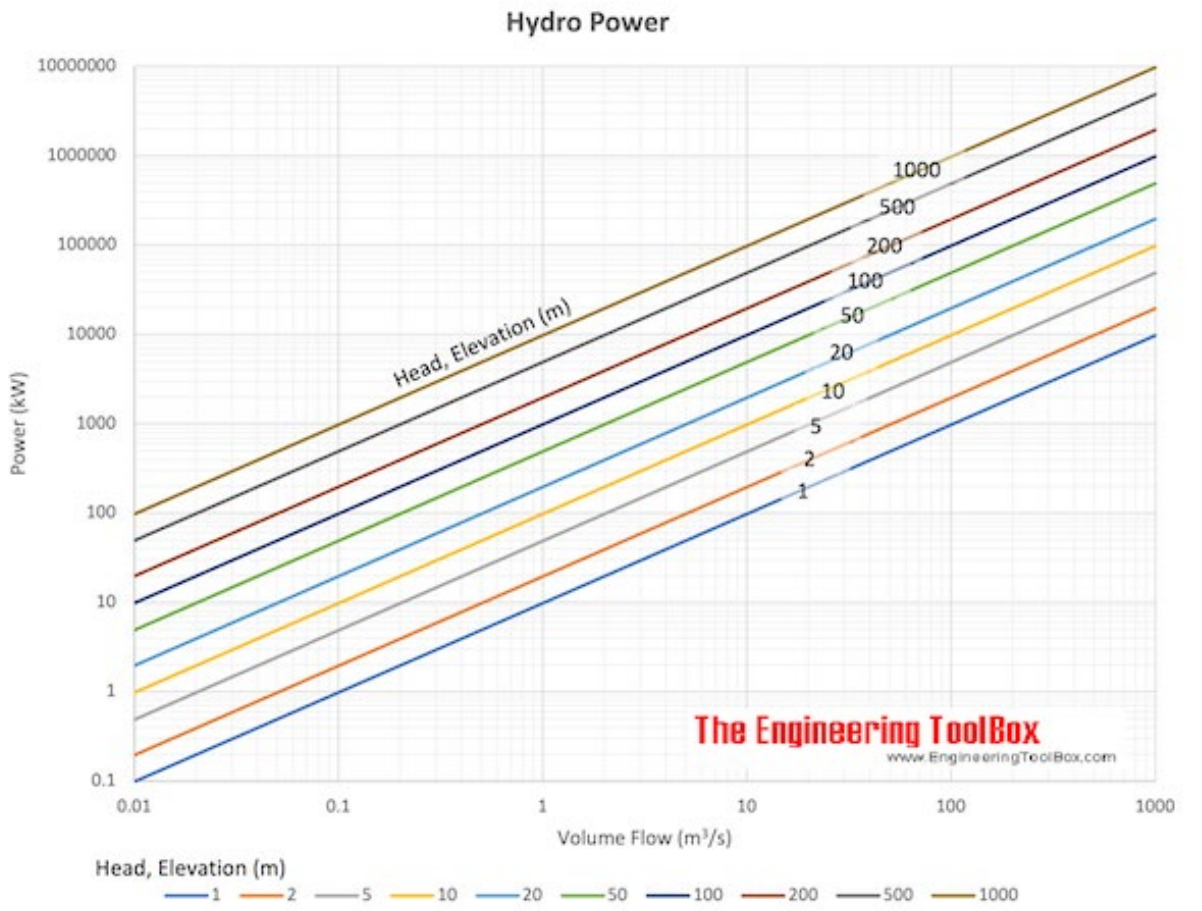
[Hydropower]



1 m^3/sec = 35.31 ft^3/sec

According to the Energy Information Administration (EIA), the average American home uses an average of **10,791 kilowatt-hours** (kWh) of electricity per year. That's 29,130 watt-hours per day, which can be divided by 24 hours to get an average of 1,214 watts (W) to power a home throughout the day.

https://www.turbulent.be/technology



link to the turbine. https://www.micro-hydro-power.com/100kw-hydro-turbine-generator/
100 kW, 134 hp, $55,000-$66,000, up to 55 m of head