

# Hydropower Fundamentals

RENG 101 – 5 Credits – October 2010

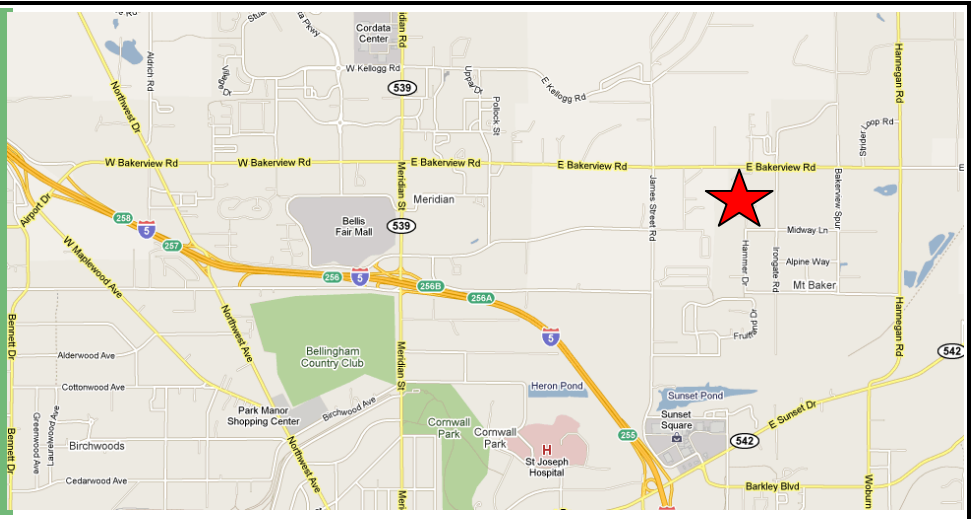


## Class Description:

This class provides the fundamentals for hydropower production. The course materials include an overview of hydrology physics, power, head, and flow-rate. In addition, the course covers traditional system components including spillways, gates, valves, trashracks, penstocks, generators, hydro batteries, and governors.

## Location:

**Building Industry Association of  
Whatcom County**  
1650 Baker Creek Place  
Bellingham, WA 98226



## Dates and Times:

The class is scheduled to run on **Tuesday and Thursday evenings at 6:00-9:00 PM from October 5<sup>th</sup> to October 28<sup>th</sup>**. This provides a total of (8) evening classes to cover the course material. Please see the Class Calendar on the last page.

## Tuition and Registration:

**Tuition for this class is \$400.** Tuition must be paid before the class begins. Program enrolled students have seniority for this class and should register online three-weeks before the class begins. Continuing education students may begin registering online two-weeks before the class begins. Students may also send class registrations by mail to the following address:

**Washington Engineering Institute**  
**Registration Office**  
**PO Box 483**  
**Custer WA 98240**

Washington Engineering Institute, PO Box 483, Custer WA 98240

website: [www.weiedu.org](http://www.weiedu.org)

email: [admin@weiedu.org](mailto:admin@weiedu.org)

phone: (360) 739-1428

## School Provided Materials:

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- **Lecture Notes:** The school provides lecture handouts as needed.
- **Guide to Hydropower.** Daniel A. New, Published by Canyon Hydro Industries. Copies provided to students with permission of Canyon Hydro Industries.

## Student Provided Materials:

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- 3 Ring Binder, calculator, engineer calculations pad (green sheets), and small straight edge for linework.
- Laptop computer with wireless capability
- Positive, motivated, respectful, and helpful classroom character

# Instructors

## Dave C. Bren, PE, MSCE Civil Engineering Technology Instructor

**Experience:** 15 years of experience in the public and private civil engineering industry. Most recent experience was as the Assistant Public Works Director for the City of Blaine. Mr. Bren established and taught the Civil Engineering Technology program at Bellingham Technical College from 1997-2006 while continuing to consult in the industry.

**Registration:** Professional Engineer  
State of Washington License #43156

**Education:** Master of Science in Civil Engineering  
University of Washington  
  
Bachelor of Science in Civil Engineering  
University of Washington

## Jim Perry, PE, MSCE, MBA Civil Engineering Technology Instructor

**Experience:** 26 years of experience in private civil engineering practice. A further 15 years as a small business owner in the custom/display packaging woodworking industry.

**Registration:** Professional Engineer  
State of Washington License #37175

**Education:** Master of Science in Civil Engineering  
California Institute of Technology  
  
Master of Administration in Business  
University of California, Riverside  
  
Bachelor of Science in Civil Engineering  
Walla Walla College

## Format:

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**Class Structure:** Evenings will typically run in one-hour blocks as follows:

6:00 PM – Class setup and first hour  
6:50 PM – Break  
7:00 PM – Class  
7:50 PM – Break  
8:00 PM – Class last hour

## Final Exam and Grades:

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Grades will be determined by attendance (20%), research project (20%), and homework assignments (60%). The Instructor holds the sole authority to issue grades and shall issue grades based on a 4.0 schedule as follows.

### Grading legend

4.0	A+
3.7	A
3.5	A-
3.3	B+
3.0	B
2.7	B-

2.4	C+
2.0	C
1.7	C-
1.4	D+
1.0	D
0.7	D-

AU	Class audited with no grade earned
EXP	Experiential credit granted per policy
EDU	Prior education credit granted per policy
I	Incomplete – Instructor Allows Extra Time to Complete
W	Withdrawn from class

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# October 2010 – Hydropower Fundamentals – RENG 101

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
				1	2	3
4	<b>5 Orientation</b> 6:00-9:00 PM Faculty & Student Introductions Program Orientation Energy, Work, Power (p4) Micro Hydro Research Project	6	<b>7 Pressure</b> 6:00-9:00 PM Whatcom/Skagit Hydropower Components of a Hydro System (p5-11) Water Pressure Calculations and Diagrams (p12-13)	8	9	10
11	<b>12 Flow</b> 6:00-9:00 PM Flow Calculations, Flow Meters, and Weirs (p14-19)	13	<b>14 Turbines</b> 6:00-9:00 PM Turbine Types (p20-23) Force and Torque Calculations Energy and Power Calculations	15	<b>16 Optional Lab</b> 9:00-12:00 AM	17
18	<b>19 Big Hydro</b> 6:00-9:00 PM Traditional Hydropower Systems History, Plans, and Analysis of Existing Local Hydropower Dam	20	<b>21 Micro Hydro</b> 6:00-9:00 PM Micro Hydro Systems Canyon Hydro guest lecture	22	<b>23 Optional Lab</b> 9:00-12:00 AM Canyon Hydro field trip (Meet at BIAWC building at 8:00am for carpooling to Deming)	24
25	<b>26 Tidal Energy and In-Water Permitting</b> 6:00-9:00 PM Tidal Energy and In-Water Permitting DOE guest lecture	27	<b>28 System Analysis</b> 6:00-9:00 PM Hydro Battery Seasonal Power Analysis Power Modeling Tollhouse Energy Guest Lecture	29	<b>30 Optional Lab</b> 9:00-12:00 AM	31

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## Class Registration Form 2010 v2.0

**Returning students with a Student ID do not need to fill out the gray portions of this form.**

<b>Name</b>	
<b>Address</b>	
<b>Phone</b>	
<b>Email</b>	

<b>Class Requested</b>	<b>RENG 101 – Hydropower Fundamentals</b>
<b>Class Month / Date</b>	<b>October 2010</b>

**WAC 490-105-160 – State Licensed School Reporting Requirements:**

<b>Student ID #</b>		
<b>SSN #</b>		
<b>Date of Birth</b>		
<b>Gender</b>		
<b>Disability</b>	<input type="checkbox"/> Yes <input type="checkbox"/> No	
<b>Race</b>	<input type="checkbox"/> American Indian or Alaska Native <input type="checkbox"/> Asian <input type="checkbox"/> Black/African American <input type="checkbox"/> Hawaiian Native or Pacific Islander <input type="checkbox"/> Hispanic <input type="checkbox"/> White/Caucasian <input type="checkbox"/> Multi-racial <input type="checkbox"/> Other	
<b>Prior Education</b>	<input type="checkbox"/> Less than high school graduation <input type="checkbox"/> GED <input type="checkbox"/> High School Graduate <input type="checkbox"/> Post H.S., no degree or certificate <input type="checkbox"/> Associate Degree <input type="checkbox"/> Bachelor Degree <input type="checkbox"/> Master or Doctorate Degree	GED Year _____ Graduation Year _____  Graduation Year _____ Graduation Year _____ Graduation Year _____
<b>Name of Last School Attended</b>		

\_\_\_\_\_  
**Student Signature**

\_\_\_\_\_  
**Date**