CVLE 431
HYDRAULIC ENGINEERING
SPRING 2006

INSTRUCTOR: Dr. Richard F. McCormick

OFFICE: GH 3G

PHONE: 696-6049

EMAIL: mccormickr@marshall.edu

OFFICE HOURS: 9 - 12 MW; other hours as posted or by appointment

TEXT: ***Water Resources Engineering***; Larry W. Mays; Wiley; 2005 Edition

REFERENCES: 1. ***Fluid Mechanics with Engineering Applications***; Finnemore and Franzini; McGraw-Hill; Tenth Edition; 2002.

2. ***Fundamentals of Hydraulic Engineering***; Prasuhn; Holt, Rinehart and Winston; 1987.

3. ***Water Resources Engineering***; Linsley, Franzini, Freyberg and Tchobanoglous; McGraw-Hill; Fourth Edition; 1992.

4. ***Hydraulic Engineering***; Roberson, Cassidy, and Chaudhry; Wiley; 2nd Edition; 1998.

OBJECTIVE: To continue the student's education in the applied fluid flow area with particular emphasis being placed upon closed conduit flow and flow in open channels.

OUTCOMES: With the successful completion of the course, the student should be able to

(a) Analyze flow in pipes and compute head losses in pipelines with various appurtences
(b) Analyze and design simple pipe networks
(c) Analyze flow in open channels
(d) Design simple sanitary sewer systems
(e) Analyze and interpret hydraulic laboratory data

GRADING BASIS: 3 Hourly Exams at 15% 45%

Homework	15%
Lab	25%
Final	15%
Total	100%

(NOTE: The breakdown for lab will be explained on the handout for lab.)

TEST SCHEDULE:

Hourly Exam #1	February 9, 2006
Hourly Exam #2	March 16, 2006
Hourly Exam #3	April 20, 2006
Final Exam	12:45 – 2:45 p. m. Monday, May 1, 2006

NOTE: These exams are scheduled for Thursdays in lab. They will begin at 2:00 p. m.

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HYDRAULIC ENGINEERING
COURSE OUTLINE

LECTURE #	TOPIC
1	Introduction
2	Fluid mechanics review--basic definitions
3	Fluids review--fluid statics
4	Fluids review--fluid dynamics/continuity
5	Fluids review--Bernoulli's equation
6	Fluids review--Bernoulli's equation examples
7	Fluids review--orifices and weirs
8	Fluids review--momentum theorem
9	**HOURLY EXAM #1**
10	Friction head loss in pipes
11	Friction loss example problems
12	Minor head losses in pipes
13	Pipe networks--parallel pipes
14	Pipe networks--branching pipes
15	Pipe networks--Hardy Cross method
16	Hardy Cross example
17	Water hammer
18	Surge tanks
19	**HOURLY EXAM #2**
20	Introduction to open channel flow
21	Development of the flow equation
22	Most efficient cross section
23	Manning's equation
24	Specific energy
25	Specific energy examples
26	Specific force
27	Hydraulic jump
28	Non-uniform flow
29	Water surface profiles
30	Step method
31	**HOURLY EXAM #3**
32	Sewer design
33	Sewer design example
34	Storm drainage
35	Dams
36	Forces on dams
37	Wind setup and waves in reservoirs
38	Stability analysis of a gravity dam
39	Earth dams
40	Spillways

Note: These lectures are designed for a MWF class. A class that meets twice a week should cover three of these lectures per week.

CVLE 431
HYDRAULICS LABORATORY
SPRING 2006

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OFFICE: GH 3G

PHONE: 696-6049 **EMAIL:** mccormickr@marshall.edu

OFFICE HOURS: 9- 12 MW; other hours as posted or by appointment

TEXT: No text is formally required for the lab. The book that you used in Fluid Mechanics can serve as a reference. One suggested reference is ***Fluid Mechanics with Engineering Applications***, Finnemore and Franzini, 10th edition, McGraw-Hill, 2002.

LAB GRADING BASIS:

Lab mid-term exam	20%
Lab Exercises/reports	60%
Lab final exam	20%
Total	100%

TEST SCHEDULE:

Lab mid-term exam	March 8, 2006 in class
Lab final exam	As scheduled by school policy

TENTATIVE (AND UNORDERED) LIST OF EXPERIMENTS TO BE PERFORMED

1. Orifice Meter Calibration
2. Weir Calibration
3. Verification of Bernoulli's Theorem
4. Laminar/Turbulent Flow (Reynold's Number)
5. Parshall Flume (in Montgomery)
6. Venturimeter Calibration
7. Turbine Performance Curve
8. Manning's Roughness Coefficient (in Montgomery)
9. Momentum Theorem/Jet Impact
10. Buoyancy and Metacentric Height
11. Friction Losses in Conduit Flow
12. Friction Losses in Valves and Fittings

ATTENDANCE POLICY

In addition to the general policies passed out in class, there is an additional attendance policy for this class. Because it is a lab class, attendance and participation is ***mandatory***. Students missing a lab session without a valid excuse (medical or institutional or approved by the instructor in advance) will be allowed to turn in a lab report for that session, but with a 20% penalty.

LABORATORY REPORTS

Reports for each experiment will be due at the beginning of the next lab period. Late reports will not be accepted. Report format instructions for each experiment will be provided at the beginning of the lab session for that experiment.

Lab reports will either be formal or informal. A formal lab report will be typewritten; will contain a purpose, discussion of theory, procedure, sample calculations, results, discussion of results, conclusions, and finally, an appendix containing the raw experimental data. Formal lab reports will be graded on the basis of the quality of the experimental results (raw data, calculations, and interpretation of results), report content and organization, spelling, grammar, neatness, and other pertinent factors. Each report should have a cover sheet giving the class number and name, experiment name and date, and the student's name and signature.

Technical reports are to be written in the third person. Do **not** say “We turned the pump on . . .”; rather, say “The pump was turned on . . .” Eliminate all personal references from technical reports, including formal lab reports.

Informal lab reports will consist of data sheets and calculations and possibly some questions and short discussions. Informal reports must be neat, but word processors/typewriters are not required for informal reports.

LABORATORY SAFETY

Safety is paramount in all of our labs. For the hydraulics lab, we will follow the WVU Tech lab safety rules as much as possible.