1. Course Title:

Fluid Dynamics
MET 315 – 5 Credits

Four hours lecture and two hours laboratory per week
MET Core Program Requirement
Prerequisite: MET 314 and IET 311
This is a Technical content course under ABET Criterion 5

2. Faculty Member Information:

Instructor: Roger Beardsley
Office: Hogue 302
Phone: 509- 963-1596
E-mail: beardslr@cwu.edu

3. Course Description:

Fluid statics, continuity, Bernoulli and the general energy equation, laminar and turbulent flow, friction losses in pipes and ducts, pump performance and selection, compressible flow, and fluid measurements.

4. Textbook and other required materials for the course:

Fundamentals of Thermal-Fluid Sciences, 2nd Edition Cengel, Yunus and Turner, Robert
McGraw Hill, 2005 ISBN 0-07-297675-6

Other Resources: Internet access, word processing, spreadsheet and graphing capability required.

5. Specific Learner and Expressive Outcomes and Assessment Strategies:

ABET Outcome Criteria #	Outcome Students will:	Assessment Strategy This shall be assessed through:
3a 9b	1. develop an understanding of the practical aspects of fluid statics & continuity by relating theory to various applications	through written homework assignments and examinations.
3f,j 9b,j	2. learn to apply the Bernoulli equation and the general energy equation and learn to evaluate the energy content within a flowing fluid	written homework assignments and examinations.
3b,f 9b,j,n	3. learn to predict the flow rate of fluids in ducts and pipes for compressible and incompressible fluids	homework assignments, quizzes, and laboratory experiments and reports.
3b 9b,j	4. learn to calculate and use dimensionless numbers such as Reynolds number, lift and drag coefficients, etc	homework assignments, quizzes, and laboratory experiments and reports.
3a 9n	5. learn terminology in the fluid dynamics technical field so that the may read, discuss and comprehend the relevant literature	homework assignments, quizzes, and laboratory experiments and reports.
3c,e 9e	6. demonstrate the ability to plan and conduct fluid mechanics experiments.	laboratory experiments and reports.
3a,c,e 9b,e,n	7. demonstrate the ability to select proper instrumentation to support experiments and have the ability to calibrate various sensors and connect sensors to data acquisition systems.	laboratory experiments and reports.
3a,c 9e,f	8. Students will perform computerized data analysis and be able to present and explain experimental results with clarity.	This shall be assessed through laboratory experiments, written and oral reports.
3g	9. Students will demonstrate the ability to write various types of test reports common in the engineering field.	This shall be assessed through laboratory written reports.

6. Course Topics and Schedule:

Intro / DefiningTerms, Classification of Fluid Flows, No Slip condition, Vapor Pressure & Cavitation
Lab 1: Specific Gravity and Density Lab
Viscosity & Newtonian Fluids, Surface Tension, Capillary Effect
Lab 2: Fluid Viscosity Lab
Hydrostatic Forces: Submerged Planes & Curved Surfaces, Buoyancy & Stability
Fluids in Rigid Body Motion
TEST #1 - Fluid Properties and Fluid Statics
Mechanical Energy & Pump Efficiency, Pump Types and Characteristics, Energy Loss & Addition
Total Energy & The Bernoulli Equation,Hydraulic Grade Line & Energy Grade Line
Applications of Bernoulli; Torricelli etc
Lab #4 - Torricelli Experiment
Energy Analysis of Steady Flow, Newton's Law, Conservation of Energy
Forces Acting on a Control Volume, Linear & Angular Momentum, Betz Limit
TEST #2 Fluid Dynamics, Bernoulli Equation & Energy Relations
Lab #5: Pump Performance Curve
Laminar & Turbulent Flow; Reynolds #, Entrance Region, Laminar & Turbulent Flow in Pipes
Colbrook Equation & Moody Chart, Equivalent Length & Head Losses, Pipe Networks
Intro to External Flow, Lift & Drag, Friction & Pressure Drag, Flow Separation, Drag Coefficients

7. Grading:

HW / Quizzes		30%	
2 Exams & Final	(3)	40%	
Lab Projects	(5)	20%	
Participation/involvement	(30)	10%	(weightings are approximate)

A(92-100), A-(90-92), B+(88-90), B(82-88), B-(80-82), C+(78-80), C(72-78), C-(70-72), D+(68-70), D(62-68), D-(60-62), F(<60)

8. ADA Statement:

Students who have special needs or disabilities that may affect their ability to access information and or material presented in this course are encouraged to contact me or Robert Harden, ADA Compliance Officer, Director, ADA Affairs and Students Assistance on campus at 963-2171 for additional disability related educational accommodations.

Prepared by Roger Beardsley June 24, 2009