METROPOLITAN STATE UNIVERSITY OF DENVER
Office of Academic and Student Affairs

REGULAR COURSE SYLLABUS

College of: Professional Studies

Department: Engineering and Engineering Technology

Prefix & Course Number: SSE 3185  Crosslisted With*:  

Course Title: Fundamental Fluid Mechanics

Banner course title (30 characters): Fundamental Fluid Mechanics

Check All That Apply:  
Required for Major: X  Required for Minor:  Specified Elective:  
Required for Concentration:  Elective:  Service Course:  

To receive Title IV financial aid funds, all institutions of higher education must comply with the federal definition of a credit hour. The Higher Learning Commission requires institutions to maintain policies and procedures for verifying compliance with this definition.

Federal Credit Hour Definition: A credit hour is an amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally-established equivalency that reasonably approximates not less than:
(1) one hour of classroom or direct faculty instruction and a minimum of two hours of out-of-class student work each week for approximately fifteen weeks for one semester or trimester hour of credit, or ten to twelve weeks for one quarter hour of credit, or the equivalent amount of work over a different amount of time; or (2) at least an equivalent amount of work as required in paragraph (1) of this definition for other activities as established by an institution, including laboratory work, internships, practicum, studio work, and other academic work leading toward the award of credit hours. 34CFR 600.2 (11/1/2010)

Credit Hours: 3 (3+0)

Face-to-Face or Equivalent Hours per course:
Lecture 45  Lab 0  Internship 0  Practicum 0  Other (please specify type and hours):  

Additional Student Work Hours per course: 90

Schedule Type: L  Grade Mode:  

Variable topics umbrella course:  No X Yes  If Yes, number of credit hours allowed  

Specified repeatable course: No X Yes  

APPROVED:  

Department Chair OR Program Director  

Dean OR Associate Dean  

Associate VP, Academic and Student Affairs  

*If crosslisted, attach completed Course Crosslisting Agreement Form
Prefix and Course Number: SSE 3185

Prerequisite(s): SSE 3160 with grade "C" or better, or permission of instructor

Corequisite(s):

Prerequisite(s) or Corequisite(s):

Banner Enforced:

Prerequisite(s): SSE 3160 all with grade "C" or better
Corequisite(s):
Prerequisite(s) or Corequisite(s):

Registration restrictions: Level ____ Class ____ Program/Major ____ Student attribute ____

Catalog Course Description:
Students in this course will study physical properties of ideal fluids and real fluids. Course material includes fluid statics, kinematics and dynamics, energy and momentum principles of fluid mechanics, dimensional analysis and the applications of the theories and principles in incompressible flow in pipes, ducts, forces on immersed bodies and steady flow in open channels.

Required Reading and Other Materials will be equivalent to:

Specific, Measurable Student Behavioral Learning Objectives:
Upon completion of this course the student should be able to:
1. apply knowledge of mathematics and science to solve fundamental fluid mechanics and hydraulics engineering problems.
2. interpret fluid mechanics experiment data and select appropriate parameters for fluid mechanics designs problems.
3. identify, formulate, and solve hydrostatics problems, continuity problems, energy problems and momentum problems, as well as analyze drag and lift forces on immersed bodies.
4. design pipeline hydraulics problems, open channel hydraulics problems for steady flow.
5. demonstrate knowledge of the impact of engineering solutions of water resources in an economic, environmental, and societal context.

Detailed Outline of Course Content:
I. Engineering Properties of Fluid
   A. Ideal Gas Law
   B. Properties Involving Thermal Energy
   C. Viscosity
   D. Bulk Modulus of Elasticity
   E. Surface Tension
   F. Vapor Pressure

II. Fluid Statics
   A. Pressure and Pressure Variation with Elevation
   B. Buoyancy
C. Forces on Submerged Plane Surfaces
D. Forces on Submerged Curved Surfaces

III. Flowing Fluid
A. Fluid Motion and Acceleration
B. Euler's Equation
C. Streamline
D. Bernoulli Equation

IV. Control Volume and Continuity Equation
A. Rate of Flow
B. Control Volume
C. Continuity Equation
D. Cavitation

V. Momentum Equation
A. Derivation and Interpretation of Momentum Equation
B. Moment-of-Momentum Equation
C. Engineering Application of Momentum Equation
D. Navier-Stocks Equation

VI. The Energy Equation
A. Energy, Work and Power
B. General Energy Equation and Engineering Application
C. Power Equation
D. Hydraulic and Energy Grade Lines

VII. Dimensional Analysis and Similitude
A. Buckingham II Theorem
B. Dimensional Analysis
C. Similitude

VIII. Surface Resistance
A. Surface Resistance with Laminar Flow
B. Concept of Boundary Layer
C. Pressure Gradient

IX. Flow in Conduits
A. Stress Distribution and Head loss
B. Laminar Flow
C. Turbulent Flow and Moody Diagram

X. Drag and Lift
A. Calculate Drag Force
B. Theorem of Left
C. Lift and Drag on Airfoil

XI. Flow Measurements
A. Measuring Velocity and Pressure
B. Measuring Flow Rate

XII. Open Channel Flow
A. Steady Uniform Flow
B. Steady Non-uniform Flow
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C. Rapidly Varied Flow
D. Hydraulic Jump
E. Gradually Varied Flow

Evaluation of Student Performance:
1. Examinations
2. Assignments
3. Class projects and/or presentations and/or reports