RECEIVED

APR 25 2007

OFFICE OF THE SENATE COUNCIL

UNIVERSITY OF KENTUCKY
APPLICATION FOR CHANGE IN EXISTING COURSE: MAJOR & MINOR

1. Submitted by College of: Engineering — Date: August 16, 2006

   Department/Division offering course: Civil Engineering

2. Changes proposed:
   (a) Present prefix & number: CE441 — Proposed prefix & number: CE541

   (b) Present Title: Fluid Mechanics II

   New Title: Intermediate Fluid Mechanics

   (c) If course title is changed and exceeds 24 characters (Including spaces), include a sensible title (not to exceed 24 characters) for use on transcripts: Intermediate Fluid Mech.

   (d) Present credits: 3 — Proposed credits: 3

   (e) Current lecture: laboratory ratio: 2:1 — Proposed: 2:1

   (f) Effective Date of Change: (Semester & Year) Fall 06

3. To be Cross-listed as: BAE541 (Prefix and Number) — Signature: Department Chair

4. Proposed change in Bulletin description:
   (a) Present description (including prerequisite(s):
   Application of basic fluid mechanics to problems of importance to civil engineering practice. This includes pipe flow (pipe networks), open channel flow, culvert flow, flow through meters, pumps and turbines. Prereq: CE 341, CS 221 or CS 223 and engineering standing

   (b) New description:
   Application of basic fluid mechanics to problems of importance to civil engineering practice. This includes flow measuring, closed conduit flow and pipe networks, open channel flow, turbomachinery (pumps), hydraulic structures, culvert flow.

   (c) Prerequisite(s) for course as changed: CE 341, CS programming course, and engineering standing or consent of instructor

5. What has prompted this proposal?
   Bring the description up to date. Allow all CE students to take this class as a technical elective and for graduate credit. The class will now be listed as prerequisite for CE642/BAE642

6. If there are to be significant changes in the content or teaching objectives of this course, indicate changes:
   The class will be available to all students for graduate credit. It has a fair amount of design and independent work, and the projects will be expanded to include more independent design and analysis. The topics covered will be covered in greater depth, consistent with graduate level expectations.

7. What other departments could be affected by the proposed change?
   MNG and BAE students may wish to take the course, and be permitted to do so.

8. Is this course applicable to the requirements for at least one degree or certificate at the University of Kentucky? ☑ Yes ☐ No

9. Will changing this course change the degree requirements in one or more programs?* ☐ Yes ☑ No
   If yes, please attach an explanation of the change.*

10. Is this course currently included in the University Studies Program? ☐ Yes ☑ No
    If yes, please attach correspondence indicating concurrence of the University Studies Committee.

11. If the course is a 100-200 level course, please submit evidence (e.g., correspondence) that the Community College System has been consulted.

*NOTE: Approval of this change will constitute approval of the program change unless other program modifications are proposed.

UNIVERSITY OF KENTUCKY
APPLICATION FOR CHANGE IN EXISTING COURSE: MAJOR & MINOR

12. If the course is 400G or 500 level, include syllabi or course statement showing differentiation for undergraduate and graduate students in assignments, grading criteria, and grading scales. ☒ Check here if 400G-500.

12. Is this a minor change? ☐ Yes ☒ No
(NOTE: See the description on this form of what constitutes a minor change. Minor changes are sent directly from the Dean of the College to the Chair of the Senate Council. If the latter deems the change not to be minor, it will be sent to the appropriate Council for normal processing.)

13. Within the Department, who should be consulted for further information on the proposed course change?

Name: Scott A Yost Phone Extension: 7-4816

Signatures of Approval:

George E Blandford — Department Chair — 10/20/06 Date

D E Kaul — Dean of the College — 3/23/07 Date

Date of Notice to the Faculty

Sharon Bell — **Undergraduate Council — 4/24/07 Date

Approved by Graduate Council — **Graduate Council — 4/12/07 Date

**Academic Council for the Medical Center — Date

**Senate Council — Date of Notice to University Senate

**If applicable, as provided by the Rules of the University Senate.

ACTION OTHER THAN APPROVAL

****

The Minor Change route for courses is provided as a mechanism to make changes in existing courses and is limited to one or more of the following:

a. change in number within the same hundred series;
b. editorial change in description which does not imply change in content or emphasis;
c. editorial change in title which does not imply change in content or emphasis;
d. change in prerequisite which does not imply change in content or emphasis;
e. cross-listing of courses under conditions set forth in item 3.0;
f. correction of typographical errors. [University Senate Rules, Section III - 3.1]

CE 541
INTERMEDIATE FLUID MECHANICS
http://courses.engr.uky.edu/CE

Instructor: Scott A. Yost 257-4816 **Lab Assistant:** TBA
yostsa@engr.uky.edu

Office Hours: Instructor: Open door policy, as long as door is open; email 24 hours a day.
Lab Assistant: TBA.

Introduction:
Welcome to CE541 and welcome to the Fall 2006 semester. As your instructor, it's my job to present and explain technical information which will help make you competent engineers, but it's also my job to help you develop and refine the communication skills to integrate this technical information into real-world engineering situations. To that end, I am continuing to find ways of delivering technical information in contexts which concurrently promote learning and application of engineering content. I look forward to a great semester. I am honored to be your instructor, and I hope you can use this class as a spring board as you begin your professional career.

Course Overview:
This second course in Fluid Mechanics-Hydraulics stresses applications and will cover topics such as hydrostatics, flow metering devices, channel flow analysis, pipeline and pipeline network analysis, turbomachinery (pumps), culvert design, and transient analysis. At the beginning of the course, students should have a basic understanding of the principles and theories developed in the first course and a basic knowledge of calculus and physics. At the end of the course, students should be able to apply the theories and principles of both courses to authentic engineering situations.

Course Texts:
Fox, McDonald, and Pritchard, **Introduction to Fluid Mechanics** (6th Edition), John Wiley & Sons, Inc.
Giles, Evett, Liu, **Fluid Mechanics and Hydraulics Schaum's outlines series**, 3rd Edition, McGraw Hill (ISBN 0070205094)

Course Notes:
In addition to the assigned text, class lectures will be supplemented with class handouts obtained from selected sources. These are available from Johnny Print copy center. Other handouts will be provided as needed.

Course Grading:
The grade for the course will be based on the following distribution:

	Undergraduate	Graduate
Homework	16%	10%
Projects*	24%	30%
Class Participation	9%	9%
Online Journal	6%	6%
Exam I	15%	15%
Exam II	15%	15%
Final Exam	15%	15%

*For those who are taking this course for graduate credit, you will be required to do the three projects individually. All undergraduate will work in groups on the projects.

Your final grade for the course with be based on the following scales:

Grading Scale for Graduate Students
100 – 90% = A
89.9 – 80% = B
79.9 – 70% = C
< 69.9% = E

Grading Scale for Undergraduate Students
100 – 90% = A
89.9 – 80% = B
79.9 – 70% = C
69.9 – 60% = D
<59.9% = E

Grading Details/Tips:
The dates for all exams are stated below in the course syllabus. The final exam will be given at the end of the semester at the time designated by the University Schedule (see below). The instructor will give the exams at night so that students may use more time to complete each planned 50min exam.

Come to class and take notes because some of the material is not covered explicitly in the text. The class participation grade will be based on attendance, in-class assignments, quizzes, scholarly work, and collegiality.

At the end of the semester, the University grade system, as defined in the general school catalog (generally known as a straight scale), will be applied to determine the corresponding final letter grade. The grade may be posted as a plus/minus.

Homework/Labs:
There are weekly labs that will consist of physical wet-labs, computer labs and homework (problem solving) labs throughout the semester. Homework is due on the date requested to receive a grade. All work must be turned in before the last day of class to preserve your class participation grade. Some lab assignments will be performed in groups in order to offer students a more authentic Civil Engineering education. Lab assignments will be designed to coordinate textual knowledge and lab applications with authentic engineering situations, and formal technical documents will be submitted at the conclusion of each project. While these reports are relatively short, it is important that groups plan together and work closely together to present a unified, professional document and presentation. More information about these assignments will be available during the labs. Unfortunately, failing to attend labs will result in a zero for class participation and a zero for the lab assignment.

Any assignments which might require a graphic presentation must be done on computer (i.e., NO hand generated graphs/plots will be accepted). Occasionally the homework assignments will require short narrative and/or descriptive essays. Your responses must be typed. This will not only give a professional look to your work, but it will aid the grader in assigning grades based on the quality of your work and not on its readability.

Some assignments require the use of the microcomputer lab. Programming assignments may be satisfied using mathematical spreadsheets, personally developed FORTRAN/C++/VISUAL BASIC computer programs, or other available software packages as specified. Optional sessions regarding use of these programs will be offered throughout the semester.

Tentative Exam Schedule:	Exam I	Thursday, October 12, 7pm
	Exam II	Thursday November 5, 7pm
	Final Exam	see University Exam Schedule

Cautions, Dangers, and Warnings:
While team work among students is strongly encouraged, remember that the work you do must be performed through your own volition and based on your own knowledge and understanding. Working together can be a rich source for learning, gaining understanding and insight. It can also be a hindrance to your understanding of the subject matter by relying too much on others. Turning in an assignment states that you agree to be bound by the University's plagiarism rules and the punishments that might result if you are found to be in violation. Because of the student reports of widespread "cheating" that occurs, you have a simple choice to make. Either you are part of the solution or part of the problem. I hope you will become part of the solution by adopting a zero-tolerance policy. We will work together and we must work together to stop this harmful practice. If any form of cheating is witnessed by you, you are required turn in a written and signed statement detailing the violation. The information to be turned in includes: the violation, the circumstances surrounding the violation, the date and time, the names of those involved in the violation, other collaborating witnesses to the violation and your contact information. I will hold this information in strict confidence for the purposes of the administration of the class. I will automatically recommend the student(s) for suspension, dismissal or expulsion if the violation appears credible.

The following are examples of violations, which may result in you receiving an "E" for an assignment, your semester grade, or being suspended, dismissed or expelled from the university (the procedure is spelled out in "Student Rights and Responsibilities" section 6.3.0 ACADEMIC OFFENSES AND PROCEDURES):

- Reading and/or copying any person's homework/labs/reports/projects/exams, except your own.
- Willfully allowing someone to read and/or copy your homework/labs/reports/projects/exams.

- Copying (in any form) old homework/labs/reports/projects/exams.
- Communicating (written, oral or otherwise) solutions for homework/labs/reports/projects/exams.
- Other activities which result in you acquiring information (or giving information to others) for the express purpose of presenting your work for a grade without the corresponding understanding/knowledge.

Things that are acceptable: You may discuss solution procedures, problem solving strategies, data needs, assignment requirements, document layout and presentation style, etc, without violation.

As a rule, ***all work that is performed for the class and turned in must be a product of your own labor and understanding***. Besides, using someone else's knowledge or work as a crutch in your own work will not help you reach your highest potential (and will show on the exams).

And finally, something to think about:

"Work like you do not need the money; Love like you have never been hurt.
Sing as if no one can hear you; And dance like there is no one to see." *Unknown*

"Life is not defined by accomplishments, but rather how we live between them."

CE541 Learning Outcomes

Non Technical: General Professional Learning outcomes:

1. To be able to plan an effective oral presentation, either on your own or with several people.

2. To be able to deliver an effective presentation with several people.

3. To be able to work with others to analyze and solve a problem.

4. To be able to work with others to plan and prepare a technical written report.

UNIT 1: Review of Hydrostatics and Flow Meter Devices

OUTCOMES:

1. To be able to define the following:
   a) hydrostatic force (or pressure).
   b) Piezometric head.

2. To be able convert between pressure and head.

3. To be able to compute the pressure anywhere in a hydrostatic fluid system.

4. To be able to compute the 2^{nd} moment of area (moment of inertia) for simple geometrical objects.

5. To be able to calculate the forces/pressure on a submerged body/surface.

6. To be able to perform a dimensional analysis using similitude properties.

7. To be able to define what a weir is and what it does. Also to be able to distinguish between the different types of weirs and where they are used.

8. To be able to define a discharge coefficient and how it is determined for different flow measuring devices.

9. To be able to explain the difference between open channel measuring devices and close conduit measuring devices.

10. To be able to define and know in what context they are used:
    a) Manometer
    b) Pressure Transducers
    c) Pitot Tube
    d) Propeller Anemometer
    e) Venturi Meter
    f) Orifice Meter

g) Broad Crested Weir
h) Sharp Crested Weir

11. To be able to explain the similarities and differences between a venturi meter and orifice meter.

12. To be able to Analyze and Design a simple Outfall diffuser.

13. Given experimental data, be able to compute the discharge coefficient for venturi and orifice meters.

14. To be able to determine the time needed to drain a tank in an unsteady flow analysis.

15. To know how to write and apply the following conservation equations:
    a) Conservation of mass (continuity).
    b) Conservation of energy.
    c) Conservation of momentum.

UNIT 2: OPEN CHANNEL FLOW

OUTCOMES:

1) To know what Uniform Flow is and how it applies to open channels.

2) To be able to calculate Uniform Flow conditions with the Manning Equation.

3) To be able to define the following terms:
    a) Steady Uniform Flow
    b) Normal Depth
    c) Steady Non-Uniform Flow
    d) Unsteady Uniform Flow
    e) Unsteady Non-Uniform Flow
    f) Gradually Varied Flow
    g) Rapidly Varied Flow
    h) Specific Energy

4) To be able to calculate Critical Depth and know what is means.

5) To know how to classify flow configurations in Open Channels (i.e. subcritical)

6) To know how to calculate conjugate and alternate depths and know the difference between the two.

7) To know how and when the three conservation laws apply to open channel flows.

8) To be able to design channels of different cross sectional shapes to carry a desired flow and to know which channel shapes are most efficient.

9) To understand the notion of 'Control' in open channel flows.

10) To be able to use Gradually Varied Flow Theory to compute water surface profiles.

11) To be able to define the following types of channel slopes:
a) Mild b) Steep c) Critical d) Adverse e) Horizontal

12) To know how to find the location of a hydraulic jump.

UNIT 3: Steady Closed Conduit Flow -- Pipe Flow

OUTCOMES:

1. To be able to identify the three major components of the energy equation.

2. To be able to identify what contributes to the head loss term in the energy equation.

3. To be able to differentiate between laminar, turbulent and transitional flow.

4. To know how to read the Moody Diagram.

5. To be able to apply the Darcy-Weisbach equation, the Hazen-Williams equation and the Manning equation to determine the head loss. To know the differences between each one.

6. To be able to use the Moody diagram, the Colebrook-White Equation, and Woods equation to determine a friction factor for the Darcy-Weisbach equation.

7. To know how to apply the conservation principles (energy and continuity) to a single pipe system in order to determine one of the following given the other two: flow, head loss, or pipe diameter.

8. To know the difference between friction losses and Minor losses.

9. To know how to convert between Minor losses and frictional losses using equivalent lengths of pipe.

10. To know how Minor loss coefficients are determined for pipe fittings and attachments.

11. To be able to calculate the hydraulic radius for both circular and noncircular pipes.

12. To know how to construct an Energy Grade Line and Hydraulic Grade Line, and know the difference between the two.

13. To know the characteristics of pipes in parallel and pipes in series.

14. To be able to solve the three reservoir branching problem.

15. To be able to compute the number of unknowns in a general branching problem.

16. To be able to apply the Hardy-Cross method to solve pipe network problems.

17. To be able to use/modify a simple computer program utilizing the Hardy-Cross method to solve pipe network problems.

UNIT 4: Turbomachinery: Pumps and Turbines

OUTCOMES:

1. To know the difference between pumps and turbines.

2. To be able to distinguish between radial flow, axial flow and mixed flow pumps.

3. To be able to identify the basic pump components.

4. To be able to construct performance curves for pumps:
   a) Head - Discharge relations
   b) Brake Power - Discharge relations
   c) Efficiency - Discharge relations
   d) Net Positive Suction Head (NPSH) - Discharge relations

5. To be able to define the following
   a) Brake Horse-Power
   b) Water Power
   c) Efficiency
   d) Positive displacement pump
   e) Specific Speed

6. To know the difference between the theoretical and actual Head-Discharge curves.

7. To be able to apply homologous pump theory.

8. To be able to define and apply the following concepts.
   a) Homologous Pumps
   b) Cavitation
   c) Parallel pumps
   d) Series pumps
   e) Pump curve
   f) Demand or System curve

9. To be able to determine if a pump will cavitate.

10. To be able to read and understand Manufacturer Pump Characteristic Curves and know how to choose a pump for a given application.

11. To be able to combine pumps in series and parallel and to determine the resulting pump curve.

12. To be able to determine the size and placement of a pump for a pipe system.

13. To know how the pump curve changes as the rotational speed changes.

14. To know how to use the Hydraulic Grade Line and Energy Grade Line in determining the placement of pumps.

UNIT 5: Unsteady Flow (as time allows)

OUTCOMES:

1. To be able to differentiate between steady flow and unsteady flow.

2. To be able to define the waterhammer effect (referred to as transient analysis or unsteady flow analysis).

3. To understand causes and effects of waterhammer in pipelines.

4. To know various methods and devices that are used to suppress waterhammer effects.

5. To understand the significance of calibration with respect to transient analysis.

6. To understand the basis equations (Jowkoski's Equation) that govern the transient flow.

7. To understand the basic closure characteristics of different types valves and how they impact the transient event.

8. To be able to distinguish between slow valve closure and rapid valve closure.