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OFFICE OF THE SENATE COUNCIL

APPLICATION FOR NEW COURSE

1. Submitted by College of Engineering Date Feb. 25, 2008

   Department/Division offering course Civil Engineering

2. Proposed designation and Bulletin description of this course

   a. Prefix and Number CE 643 b. Title* Mechanics of Sediment Transport

   *NOTE: If the title is longer than 24 characters (including spaces), write A sensible title (not exceeding 24 characters) for use on transcripts MECH SEDIMENT TRANSPORT

   c. Lecture/Discussion hours per week 3 d. Laboratory hours per week

   e. Studio hours per week f. Credits 3

   g. Course description Fundamentals of turbulence in rivers and sediment transport will be taught including recent theory, derivation of governing equations, experimental methods, modeling, and design based on sediment thresholds.

   h. Prerequisites (if any)

   CE 341 or consent of instructor.

   i. May be repeated to a maximum of N/A (if applicable)

4. To be cross-listed as BAE 643 (Prefix and Number) _____ (Signature, Chairman, cross-listing department)

5. Effective Date Fall 2009 (semester and year)

6. Course to be offered ■ Fall ☐ Spring ☐ Summer

7. Will the course be offered each year? (Explain if not annually) ■ Yes ☐ No

8. Why is this course needed?

   The course is needed to teach the fundamentals of open channel turbulence and sedimentation to water resources graduate students.

9. a. By whom will the course be taught? James Fox, Assistant Prof in Civil Engineering

   b. Are facilities for teaching the course now available? If not, what plans have been made for providing them? ■ Yes ☐ No

APPLICATION FOR NEW COURSE

10. What enrollment may be reasonably anticipated? 10-15 students

11. Will this course serve students in the Department primarily? ■ Yes ☐ No

Will it be of service to a significant number of students outside the Department? ☐ Yes ■ No
If so, explain.

Will the course serve as a University Studies Program course? ☐ Yes ■ No

If yes, under what Area? _____

12. Check the category most applicable to this course

- ■ traditional; offered in corresponding departments elsewhere;
- ☐ relatively new, now being widely established
- ☐ not yet to be found in many (or any) other universities

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

14. Is this course part of a proposed new program: ☐ Yes ■ No
If yes, which?

15. Will adding this course change the degree requirements in one or more programs?* ☐ Yes ■ No
If yes, explain the change(s) below

16. Attach a list of the major teaching objectives of the proposed course and outline and/or reference list to be used.

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

18. 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. ☐

19. Within the Department, who should be contacted for further information about the proposed course?

Name James F. Fox Phone Extension 7-8668

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

APPLICATION FOR NEW COURSE

Signatures of Approval:

George E Blandford Department Chair	March 7, 2008 Date
Richard Livingood Dean of the College	10/2/08 Date
	9/15/08 Date of Notice to the Faculty
*Undergraduate Council	Date
*University Studies	Date
*Graduate Council	12/8/08 Date
*Academic Council for the Medical Center	Date
*Senate Council (Chair)	Date of Notice to University Senate

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

ACTION OTHER THAN APPROVAL

Rev 3/04

SYLLABUS – CE 643/BAE 643 (page 1/4)

Section 001
Mechanics of Sediment Transport
Department of Civil Engineering at UK
Credits: 3.0
FALL 2009

Classroom: MW 3:00 – 4:15 p.m. in O. H. Raymond Building – Room 53
Instructor: Dr. James F. Fox
Office: O. H. Raymond Building – Room 354G
Phone: (859) 257-8668
Email: jffox@engr.uky.edu
Office hours: MW 4:15 – 6:00 p.m. or by appointment
Course Description: Fundamentals of turbulence in rivers and sediment transport will be taught including recent theory, derivation of governing equations, experimental methods, modeling and design based on sediment thresholds.
Prerequisites: CE 341 or consent of instructor.

Course Objectives: The overall course objective is to understand and model sediment transport processes in turbulent rivers. To meet this broad objective, turbulence and sediment processes will be taught including derivation of all relevant equations, either fundamentally or using dimensional analysis, and deterministic and stochastic modeling approaches will be discussed. Experimental advances will also be discussed throughout the course. Specific learning objectives include the following:

1. To understand the principles of open channel turbulent flow including the theory of time-average and instantaneous turbulence.
2. To understand the fundamental equations of turbulent motion and their derivations and approximations.
3. To know the methods of experimental research for turbulence in open channels.
4. To compute turbulence parameters, e.g., turbulent intensity, eddy viscosity, energy dissipation, and Reynolds stresses using experimental data and to interpret the results.
5. To understand the impact of turbulence upon sediment motion in light of past and current approximation methods and experimentation.
6. To understand the importance of dimensional analysis for sediment parameter derivation.
7. To understand and be able to compute particle settling velocity for different laboratory and field conditions.
8. To understand and be able to analyze incipient motion conditions for sediment on streambeds and streambanks for different laboratory and field conditions.
9. To understand and be able to assess river geomorphologic regimes including bedform categorization.
10. To understand the principles of bedform initiation and migration.
11. To understand and be able to compute suspended load and bedload estimates for different laboratory and field conditions.
12. To understand the impact of sediment upon flow roughness.
13. To understand the structure, derivation and application of comprehensive sediment transport modeling.

Required Text and Notes:

1. Text: Fluvial Processes in River Engineering by Howard H. Chang, San Diego State University, ISBN: 1-57524-086-6. The book was published by John Wiley & Sons, New York, NY in 1988. It may be purchased from Krieger Publishing Company, P.O. Box 9542, Melbourne, FL 32902-9542, Ph: (407) 724-9542, FAX: (407) 951-3671 or from amazon.com.
2. Class Notes provided by the instructor are pivotal to the understanding of the material.
3. Journal articles will be part of required reading assignments. Articles will be provided by Dr. Fox or will need to be downloaded from UK Library website or photocopied from the library.
4. In addition to lectures, movies and laboratory demonstrations will be used to visualize and explain sediment transport phenomena.

References:

1. White, Frank M. Fluid Mechanics 6th Edition. McGraw Hill, 2006, ISBN: 978-0-07-293844-9. OR other undergraduate fluids textbook.
2. Panton, R. L. Incompressible Flow 3rd Edition. Wiley Publishing, 2005, ISBN: 978-0-471-26122-3. OR other graduate level fluids textbook.
3. Jain, S. C. Open-Channel Flow. Wiley Publishing, 2001, ISBN 0-471-35641-7. OR other open channel flow text.
4. Nezu and Nakagawa. Turbulence in Open Channel Flows. IAHR Monograph Publication, 1993, ISBN 90-5410-118-0.
5. Graf, W. H. Hydraulics of Sediment Transport. Water Resources Publications, LLC, 1984, ISBN 07-023900-2.
6. Chien and Wan. Mechanics of Sediment Transport. ASCE Press, 1999, ISBN 0-7844-0400-3.
7. Simons and Senturk. Sediment Transport Technology. Water Resources Publications, LLC, 1992, ISBN 0-918334-66-7.
8. Raudkivi, A.J. Loose Boundary Hydraulics. Pergamon Press 1990, ISBN 90-5410-447-3.
9. Yalin, M.S. Mechanics of Sediment Transport. Pergamon Press, 1977, ISBN 0080211623.
10. Przedwojski, Blazejewski and Pilarczyk. River Training Techniques. A.A.Balkema, 1995, ISBN 90-5410-196-2.

Library Tools: The use of library databases will be needed including Compendex, Elsevier (ScienceDirect), Google Scholar, and Wiley databases.

Assignments: Homework assignments, reading assignments, and literature write-ups will be required. Homework Assignments will typically be due one week after being assigned and may include handwritten and computational exercises. Reading assignments and write-ups that critique a journal article will typically be due the next class period. One longer project write-up will be discussed later in the semester that will discuss a specific transport process pertinent to the student's area of interest. Some howework assignments will be given via email. Please send the Instructor your email in order to be included on the email mailing list.

Tests: Midterm and Final Exams will be required for this course.

Workload: At least 6 hours outside of class for every lecture. Please be forewarned: The class moves very quickly. Please do not allow yourself to fall behind.

Honor Code: The Code of Student Conduct applies to all work in this class. Discussion of homework is encouraged; however, homeworks submitted for a grade must reflect the work of the individual student. Discussion with classmates or any outside source is prohibited for take-home exams.

Attendance: Attendance is expected. Students should come prepared to class. Participation during lecture is encouraged. Dr. Fox appreciates being notified of absences in advance.

Grading Policy:

Midterm Exam	=30%
Final Exam	=30%
Homework assignments	=25%
Literature write-ups	=5%
Projects	=10%
	100%

100---**A**---90---**B**---80---**C**---70---**E**

Important dates:

January 21 – Monday – Martin Luther King, Jr. Birthday – Academic Holiday
February 27 – Wednesday – Midterm Exam
March 3 – Monday – Midterm of the 2006 spring semester
March 7 – Friday – Last day to withdraw from class
March 10-15 – Monday through Saturday – Spring Break – Academic Holidays
April 25 – Friday – Last day of classes
April 28 – Final Exam

Special Notes:

1. Late and sloppy homework will not be accepted nor will any make-up exams be given unless an excused absence is verified following university policy.
2. Homework assignments must be neat, organized, and written on only one side of a paper. Typed assignments must be written in 12-pnt font, Times New Roman style.
3. Cheating and plagiarism are in violation of University and Departmental policy and will not be tolerated in this class. Minimum penalty for either cheating or plagiarism is an "E" in the course, with suspension and dismissal from the University also as possibilities.
4. Copying homework assignments from students in this class, previous classes, or the textbook solution manual will be treated as cheating.
5. Any student with a disability who is taking this course and needs classroom or exam accommodations should notify the instructor and contact the Disability Resource Center, 257-2754, Room 2 Alumni Gym, jkames@uky.edu.
6. Please do not hesitate to contact me if you have any problems or questions throughout the class with class technical content or instruction. Open, respectful communication is welcomed and promoted in this class.
7. For any problems that cannot be handled between the instructor and student, please contact George Blandford, Chair of the Department of Civil Engineering.

Class content:

Traditional Fluid Mechanics

- Differential analysis, control volume analysis, and dimensional analysis
- Vector and tensor analysis and index notation
- Laws of motion including Continuity and Momentum

Turbulent Flow in Rivers

- Fundamental equations of turbulent motion
- Turbulence instrumentation and experimental measurements
- Time-avearage characteristics of turbulence
- Velocity profiles over smooth and rough beds
- Roughness formula in open channels
- Instantaneous turbulence and turbulent statistics
- Interaction of turbulent flow structures with sediment

MIDTERM EXAM

Sediment Transport Processes

- Concepts of fluvial geomorphology
- Particle settling velocity and modeling
- Sediment incipient motion (non-cohesives and cohesives) and design of stable channels
- Scour at hydraulic structures and bridge piers
- Suspended sediment transport and modeling (deterministic, probabilistic)
- Bedform initiation, migration, and impact upon resistance in lowland and steep rivers
- Bedload transport and modeling (deterministic, fractional, and stochastic methods)
- Sediment Transport Capacity of the flow
- Non-linearity of sediment-fluid motion
- Comprehensive sediment transport modeling

FINAL EXAM

Nikou, Roshan

From: Graduate.Council.Web.Site@www.uky.edu
Sent: Tuesday, December 02, 2008 10:04 PM
To: Nikou, Roshan
Cc: Price, Cleo
Subject: Investigator Report

AnyForm User: www.uky.edu
AnyForm Document: http://www.research.uky.edu/gs/GCInvestigatorReport.html
AnyForm Server: www.uky.edu (/www/htdocs/AnyFormTurbo/AnyForm.php)
Client Address: 75.90.150.105

College/Department/Unit: = CE 643
Category:_ = New
Date_for_Council_Review: = 12/4/08
Recommendation_is:_ = Approve
Investigator: = Bill Smith
E-mail_Address = bsmith@engr.uky.edu
1__Modifications: = None
2__Considerations: = N/A
3__Contacts: =
4__Additional_Information: =

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