APPLICATION FOR CHANGE IN EXISTING COURSE: MAJOR and MINOR

1. Submitted by the College of: Engineering Date: Sept 2, 2009

   Department/Division offering course: Civil Engineering

2. What type of change is being proposed? ☑ Major ☐ Minor*

*See the description at the end of this form regarding 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 Senate Council chair deems the change not to be minor, the form will be sent to the appropriate Council for normal processing and an email notification will be sent to the contact person.

PROPOSED CHANGES

Please complete all "Current" fields.

Fill out the "*Proposed*" field only for items being changed. Enter N/A if not changing.

Circle the number for each item(s) being changed. For example: (6.)

3. Current prefix & number: CE 461G *Proposed prefix & number:* N/A

4. Current Title: Hydrology

   Proposed Title†: Water Resources Engineering

   †*If title is longer than 24 characters, offer a sensible title of 24 characters or less:*

5. Current number of credit hours: 3 *Proposed number of credit hours:* 4

6. Currently, is this course repeatable? YES ☐ NO ☑ If YES, current maximum credit hours:

   Proposed to be repeatable? YES ☐ *NO* ☑ *If YES, proposed maximum credit hours:*

7. Current grading system: ☑ Letter (A, B, C, etc.) ☐ Pass/Fail

   Proposed grading system: ☑ *Letter (A, B, C, etc.)* ☐ *Pass/Fail*

8. Courses must be described by at least one of the categories below. Include number of actual contact hours per week for each category.

   Current:

CLINICAL	COLLOQUIUM	DISCUSSION	LABORATORY	3 LECTURE
INDEPEND. STUDY	PRACTICUM	RECITATION	RESEARCH	RESIDENCY
SEMINAR	STUDIO	OTHER – Please explain:		

   Proposed:

CLINICAL	*COLLOQUIUM*	*DISCUSSION*	*LABORATORY*	4 *LECTURE*
INDEPEND. STUDY	*PRACTICUM*	*RECITATION*	*RESEARCH*	*RESIDENCY*
SEMINAR	*STUDIO*	*OTHER – Please explain:*		

9. Requested effective date (term/year): Fall / 2009

10. Supplementary teaching component: ☑ N/A ☐ Community-Based Experience ☐ Service Learning ☐ Both

    Proposed supplementary teaching component: ☐ *Community-Based Experience* ☐ *Service Learning* ☐ *Both*

APPLICATION FOR CHANGE IN EXISTING COURSE: MAJOR and MINOR

11. Cross-listing: ☑ N/A or _____ / _____
Current Prefix & Number — printed name — Current Cross-listing Department Chair — signature

a. Proposed – REMOVE current cross-listing: ☐ _____ / _____
printed name — *Current Cross-listing Department Chair* — signature

b. Proposed – ADD cross-listing: _____ / _____
Prefix & Number — printed name — *Proposed Cross-listing Department Chair* — signature

12. Current Distance Learning (DL) status: ☐ Already approved for DL ☐ *Please Add* ☐ *Please Drop*

If PROPOSING, check one of the methods below that reflects how the majority of the course content will be delivered.

Internet/Web-based ☐ *Interactive Video* ☐ *Extended Campus* ☐

13. Current prerequisites:

CE 341 and engineering standing or consent of instructor.

Proposed prerequisites:

same

14. Current Bulletin description:

A study of the laws governing the occurrence, distribution, and movement of water and contaminant substances in watershed systems. Meteorological considerations, precipitation, evaporation, transpiration, infiltration, streamflow, hydrograph analysis, flood routine, groundwater flow, and frequency analysis. Principles and mathematical models describing the propagation of contaminants in rivers, lakes, soils, and groundwater.

Proposed Bulletin description:

A hydrological and hydraulic study of the laws governing the occurrence, distribution, and movement of water in watershed systems. Meteorological considerations, precipitation, evaporation, infiltration, streamflow, hydrograph analysis, flood routing, open channel hydraulics, culvert design, pump systems, groundwater flow, and frequency analysis. Principles of mathematical models that describe the flow processes in a natural watershed and hydraulic structures.

15. What has prompted this change?

We reduced required fluid related classes in our curriculum from 12 cr hrs down to 7 and we realize this streamlining had too dramatic of an impact on the necessary knowledge that students need, specifically in hydraulics. We have reviewed our past changes and are proposing changes.

16. If there are to be significant changes in the content or teaching objectives of this course, indicate changes:

We will be keeping 90% of the same material as originally contained in the class. The 1cr hr addition to the course will include the following: review of closed conduit flow, open channel hydraulics, fundamental anaylsis of pumps, and expanded culvert design principals.

17. Please list any other department that could be affected by the proposed change:

N/A

18. Will changing this course change the degree requirements for ANY program on campus? ☑ YES ☐ NO

If YES‡, list below the programs that require this course:

Civil Engineering

‡ In order for the course change to be considered, program change form(s) for the programs above must also be submitted.

APPLICATION FOR CHANGE IN EXISTING COURSE: MAJOR and MINOR

18. Is this course currently included in the University Studies Program? ☐ Yes ☑ No

19. ☑ Check box if changed to 400G or 500. If changed to 400G- or 500-level, *you must include a syllabus showing differentiation* for undergraduate and graduate students by (i) requiring additional assignments by the graduate students; and/or (ii) the establishment of different grading criteria in the course for graduate students. (See *SR 3.1.4)*

20. Within the department, who should be contacted for further information on the proposed course change?

Name: Scott A. Yost Phone: 257-4816 Email: yostsa@engr.uky.edu

21. Signatures to report approvals:

October 12, 2007 DATE of Approval by Department Faculty	George E. Blandford George E Blandford printed name / Reported by Department Chair / signature
Nov 20, 2008 DATE of Approval by College Faculty	RICHARD J. SWEIGARD / Richard J Sweigard printed name / Reported by College Dean / signature
2/10/2009 *DATE of Approval by Undergraduate Council	Sharon Gill printed name / Reported by Undergraduate Council Chair / signature Digitally signed by Sharon Gill DN: cn=Sharon Gill, o, ou=Undergraduate Education, email=sgill@uky.edu, c=US Date: 2009.03.04 11:07:49 -05'00'
*DATE of Approval by Graduate Council	printed name / Reported by Graduate Council Chair / signature
*DATE of Approval by Health Care Colleges Council (HCCC)	printed name / Reported by Health Care Colleges Council Chair / signature
*DATE of Approval by Senate Council	Reported by Office of the Senate Council
*DATE of Approval by the University Senate	Reported by the Office of the Senate Council

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

****

Excerpt from *University Senate Rules:*

SR 3.3.0.G.2: **Definition.** A request may be considered a minor change if it meets one of the following criteria:

a. change in number within the same hundred series;
b. editorial change in the course title or description which does not imply change in content or emphasis;
c. a change in prerequisite(s) which does not imply change in content or emphasis, or which is made necessary by the elimination or significant alteration of the prerequisite(s);
d. a cross-listing of a course under conditions set forth in *SR 3.3.0.E*;
e. correction of typographical errors.

CE 461G
Water Resources Engineering

CREDIT HOURS: 4 (MW 1:45 min)

COURSE DESCRIPTION

A hydrological and hydraulic study of the laws governing the occurrence, distribution, and movement of water and contaminant substances in watershed systems. Meteorological considerations, precipitation, evaporation, infiltration, streamflow, hydrograph analysis, flood routing, open channel hydraulics, culvert design, pump systems, groundwater flow, and frequency analysis. The course also discusses principles of mathematical models that describe the flow processes in a natural watershed and hydraulic systems.

COURSE OVERVIEW

This course is concerned with a basic understanding and application of the principles of hydrology and hydraulics. Hydrology is that science concerned with the occurrence, properties, distribution, and movement of water in the natural and man-made environment. Hydraulics is the physics of fluid flow in both natural and man-made systems. This course will examine basic hydrologic processes as well as practical applications in the areas of water supply, drainage design, culvert design, pump station design and stormwater management. The course will also provide an introduction to various computer models used in hydrologic/hydraulic analysis and spatial analysis tools. Tools that are integrated in the course are: ArcView 3.3 (Geographical Information System software) HEC-HMS (Hydrological Modeling System), HEC-RAS, and others.

COURSE TEXT

The recommended text book for the course is **"Hydrology and Floodplain Analysis", by Bedient, Huber and Vieux** published by Prentice Hall, 2007/2008, Fourth Edition. Additional material will be drawn from a set of class lectures notes that will be posted on the course web site after each class for printing.

EDUCATIONAL OBJECTIVES

1. To provide the student with a basic understanding of hydrologic data and hydrologic processes
2. To provide the details of regular observations related to hydrologic data throughout US
3. To enable the student to predict the peak discharge for a given watershed and associated design frequency.
4. To enable the student to design a storm sewer systems for a given watershed and associated design frequency.
5. To enable the student to predict the storm hydrograph for a given watershed resulting from a given rainfall event.
6. To enable the student to predict the hydrograph transformation that occurs as it passes through a reservoir or stream channel using flow routing.
7. To enable the student to develop a stormwater management plan for a given watershed and an associated drainage ordinance.

8. To enable student to use spatial analysis tools for modeling and understanding hydrologic processes at different spatial scales.
9. To provide students the basic understanding of hydraulics with particular emphasis open channel flow and pumps.
10. To enable the student to design culverts, pump stations and water supply reservoir.
11. To provide the student with a basic introduction of groundwater flow processes.

OUTCOMES

For Educational Objective 1, the specific learning outcomes are:

1.1 To be able to access streamflow, rainfall, and geographic data from the internet.
1.2 To be able to construct and apply inductive models of hydrologic processes
1.3 To be able to construct and apply deductive models of hydrologic processes

For Educational Objective 2, the specific learning outcomes are:

2.1 To be able to delineate a watershed and determine it's area, time of concentration, and hydrologic curve number.
2.2 To enable the student to predict the peak discharge for a given watershed using the following methods:
   a. Frequency Analysis
   b. Regression Analysis
   c. Rational Method

For Educational Objective 3, the specific learning outcomes are:

3.1 Construct a rainfall hyetograph for a given storm duration and frequency
3.2 Construct a runoff hyetograph from a given rainfall hyetograph using an appropriate infiltration model
3.3 Derive, transform, and apply a unit hydrograph for a given watershed
3.4 Develop a synthetic unit hydrograph given appropriate watershed parameters.

For Educational Objectives 4 & 5, the specific learning outcomes are:

4.1 Route a hydrograph through a stream channel using either the Muskingum or Kinematic Wave method
4.2 Route a hydrograph through a reservoir or detention basin using the storage indication method

For Educational Objectives 6and 7, the specific learning outcome is:

Using principals included in HEC-HMS and HEC-RAS develop a model of a given watershed and channel reach, and determine the size and dimensions of the necessary stormwater detention basin to meet the conditions of a specific drainage ordinance.

For Educational Objective 8, the specific learning outcome is:

Use ArcView 3.3 (or equivalent) to delineate watershed, find the area of the watershed, locate streams and find the length of the streams and other hydrologic parameters.

For Educational Objective 9, the specific learning outcomes are:

9.1 To understand the control in an open channel and associated flow profiles.
9.2 To understand the basic pump curves and how they are used to determine pump usage.

For Educational Objective 10, the specific learning outcomes are:

10.1 To understand the flow control of a culvert when acting as an open channel or a closed conduit.
10.2 To be able to size a culvert and stormwater retention/detention system.
10.2 To be able to determine the basic pump characteristics and the size of the pump station.

For Educational Objective 11, the specific learning outcome is:

Flow into confined and unconfined aquifers and properties of soil, pumping tests, permeability estimation.

COURSE GRADING
The grade for the course will be based on the following distribution. Note that students who are taking the course for graduate credit must submit a term paper (details given in class) by the end of the semester, with an abstract due by midterm:

Marking item	Undergraduate	Graduate
Homework	20%	15%
Class Projects	10%	10%
Quiz I &II	5 %	5%
Exam I	19%	17%
Exam II	19%	17%
Final Exam	27%	25%
Term Paper	NA	11%

Criteria for letter grades based on total score.

Undergraduate students	Graduate Students
90 – 100 : A	**90 – 100 : A**
80 – 89.99 : B	**80 – 89.99: B**
70 – 79.99 : C	**70 – 79.99: C**
60 - 69.99 : D	**below 70 : E**
below 60 : E	

Curving of grades will not be done for this course. **Final examination** Marks will be posted on the course web site. Examination questions are drawn from class lectures, lecture notes, homework assignments, suggested course text book and solved problems from the text book. **The format of all examinations will usually be 20 multiple choice questions (in which more than one answer may be correct) and full length problems. The time for first two examinations is 50 minutes each. Partial credit may be given in full length problems if the concepts and units used are correct. The duration of Final examination is 2 hrs. The quiz I and quiz II will be for 10 min duration with 5 multiple choice questions.**

EXAMINATIONS

All the examinations are **closed book and closed notes tests**. Exams I and II **may be cumulative** relevant to the course syllabus. The **final exam will be cumulative** in nature and given at the end of the semester at the time designated by the University Schedule. The dates for all exams will be announced in class at least two weeks before and will be confirmed by the instructor. You are expected to keep up with the material being presented and class attendance is important because some of the material is not covered explicitly in the text. 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.

Tentative Dates for Examinations:

EXAM I: October 13, 2008
EXAM II: November 12, 2008
(To be confirmed by the instructor in the class. Instructor's confirmation is final)

HOMEWORK:

Assignments will be made regularly (usually weekly – given **Wednesday** and are due on following **Wednesday**) throughout the semester. Late homework within a specific time frame, can be turned in for evaluation but will not contribute positively toward the final grade unless accompanied by the **University approved excuse (e.g. medical reasons- with Doctor's note)**.

Any homework assignments which require a graphic presentation must be done on computer **(i.e., NO hand generated graphs/plots will be accepted). Plagiarism and cheating** of any form in the assignments, examinations and projects is not acceptable.
Refer to http://www.uky.edu/StudentAffairs/Code/part2.html (rules 6.3.1 and rule 6.3.2). These rules will be strictly followed and applied for cases related to plagiarism and cheating.

Note:

- **All completed homework assignments should be submitted to Instructor in the class on Wednesday. Instructor will not accept any assignment /project submitted out side the class hours on due dates!!**
    - **Teaching Assistant will not accept any assignments from Students.**
    - **If you are unable to attend the class for some reason, make arrangements to submit the assignment in the class.**
    - **Graded assignments are distributed in the class on Wednesdays. Solutions to assignments are provided to students in the class and any uncollected graded assignments are kept outside Instructor's office.**

CLASS PROJECT(S)

Two or more (generally three) hydrologic analysis and design projects are required to be completed as a part of the course. Students will be given at least two weeks to complete each project and will have plenty of opportunity for questions. Unless otherwise stated, projects will require formal write-ups, type written and presented in a professional manner. As with homework assignments, projects which might require a graphic presentation must be done on a computer (i.e. **No hand generated graphs/plots will be accepted**). This will not only give a

professional look to your work, but it will aid in assigning grades based on the quality of your work and not its readability.

Note: some homework or projects require the use of the computer lab. Programming assignments may be satisfied using mathematical spreadsheets, personally developed BASIC or FORTRAN or C computer programs, or other available software packages as specified.

The whole course content is divided into a number of units. Complete information is given on the course web site.

UNIT 1: Introduction to Hydrology (Chapter 1.)
UNIT 2: Precipitation (Chapter 1 and additional reading from Chapter 11)
UNIT 3: Evaporation, Evapotranspiration (Chapter 1 and additional reading material)
UNIT 4: Infiltration (Chapter 1 and additional lecture notes)
UNIT 5: Streamflow (Chapter 2)
UNIT 6: Open Channel Hydraulics (Class lecture notes)
UNIT 7: Storm Hydrography (Chapter 2)
UNIT 8: Peak Discharge Analysis (Chapter 3)
UNIT 9: Hydrologic Design (Class lecture notes)
UNIT 10: Reservoir Design (Class lecture notes)
UNIT 11: Closed Conduit Flow- Review (Class lecture notes)
UNIT 12: Pump and Pump station design (Class lecture notes)
UNIT 13 Graphical Tools for Hydrologic Analysis (Class notes to be posted on the course web site)
UNIT 14:Introduction to ArcView (additional reading: Chapter 10)
UNIT 15: Flood Routing (Chapter 4)
UNIT 16: Drainage System Design (Chapter 6)
UNIT 17: Stormwater Detention Basin Design (Class notes and some material from Chapter 6)
UNIT 18: Watershed Models (Chapter 5 and additional reading from Class notes)
UNIT 19: Introduction to Groundwater Hydrology (Chapter 8)
Refer to additional documentation provided along with this document.
(All the units are covered in the course with the help of course text and lecture notes)

Lecture notes are developed by instructor for instructional purposes only. Students are strongly encouraged to read the material from the relevant chapters of the textbook, especially the solved problems to gain good understanding of concepts.

Instructional software Arcview 3.3, HEC-HMS and HEC-RAS modeling system are available in the Civil Engineering software lab located in the second floor of Oliver Raymond building.

ADDITIONAL INSTRUCTIONS ABOUT THE COURSE:

1. **Examination questions are derived from classroom lectures, lecture notes, recommended class text book and home work problems. The questions that appear in examinations may not exactly resemble the problems that were discussed in the class, lecture notes, text book or in home work assignments.**
2. **Examinations should be written using a PEN**
3. **No curving of grades**
4. **Mid-term examination dates will be confirmed by instructor in the class and final dates will be posted on the course web site**
5. **Multiple choice questions are the most difficult part of examinations which require very good understanding of concepts. Regular attendance to classes will benefit to score better marks in the tests. Multiple answers are possible.**
6. **Homework assignments may be posted on the web and a copy of the homework assignment is distributed only in the class.**

7. **Material relevant to course is handed out to students in the class.**
8. **Solutions to homework assignments will be provided.**
9. **15 to 20 days of time is provided for each project**
10. **Students are required to attend all the examinations. Final exam is NOT optional**
11. **Results of the tests are provided to students within a week after the test is conducted.**

All students of CE461G class are required to read and understand the material in this document, explicitly stated objectives and outcomes of the course, responsibilities and marking scheme and additional instructions about this course.