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FORMAT 2

Submit originals (including syllabus) and one copy and electronic copy to the **Faculty Senate Office**
See http://www.uaf.edu/uafgov/faculty-senate/curriculum/course-degree-procedures-/ for a complete description of the rules governing curriculum & course changes.

CHANGE COURSE (MAJOR) and DROP COURSE PROPOSAL
Attach a syllabus, except if dropping a course.

SUBMITTED BY:

Department	Civil and Environmental Engineering	College/School	College of Engineering and Mines
Prepared by	David L. Barnes	Phone	6126
Email Contact	dlbarnes@alaska.edu	Faculty Contact	David L. Barnes

1. COURSE IDENTIFICATION: As the course now exists.

Dept	CE	Course #	F463	No. of Credits	3

COURSE TITLE	Groundwater Dynamics

2. ACTION DESIRED: √ Check the changes to be made to the existing course.

Change Course	X	If Change, indicate below what is changing.	Drop Course	

NUMBER		***TITLE***		***DESCRIPTION***	
PREREQUISITES*				***FREQUENCY OF OFFERING***	

*Prerequisites will be *required* before a student is allowed to enroll in the course.

CREDITS (including credit distribution)		***COURSE CLASSIFICATION***	
ADD A STACKED LEVEL *(400/600)* *Include syllabi.*	X	Dept. CE	Course # F463

How will the two course levels differ from each other? How will each be taught at the appropriate level?:	The graduate level course will be required to write a small computer program solving the partial differential equation for groundwater flow. The undergraduate students will not be required to develop this model

Stacked course applications are reviewed by the (Undergraduate) Curricular Review Committee and by the Graduate Academic and Advising Committee. Creating two different syllabi—undergraduate and graduate versions—will help emphasize the different qualities of what are supposed to be two different courses. The committees will determine: 1) whether the two versions are sufficiently different (i.e. is there undergraduate and graduate level content being offered); 2) are undergraduates being overtaxed?; 3) are graduate students being undertaxed? In this context, the committees are looking out for the interests of the students taking the course. Typically, if either committee has qualms, they both do. More info online - see URL at top of this page.

ADD NEW CROSS-LISTING		Dept. & No.		Requires approval of both departments and deans involved. Add lines at end of form for additional signatures.
STOP EXISTING CROSS-LISTING		Dept. & No.		Requires notification of other department(s) and mutual agreement. Attach copy of email or memo.
OTHER (specify)				

3. COURSE FORMAT

NOTE: Course hours may not be compressed into fewer than three days per credit. Any course compressed into fewer than six weeks must be approved by the college or school's curriculum council **and** the appropriate Faculty Senate curriculum committee. Furthermore, **any core course compressed to less than six weeks must be approved by the Core Review Committee.**

COURSE FORMAT: (check **all** that apply)		*1*		*2*		*3*		*4*		*5*	X *6 weeks to full semester*
OTHER FORMAT (specify all that apply)											
Mode of delivery (specify lecture, field trips, labs, etc.)	**Lecture**										

4. **COURSE CLASSIFICATIONS:** (undergraduate courses only. Use approved criteria found in Chapter 12 of the curriculum manual. If justification is needed, attach separate sheet.)

H = Humanities		S = Social Sciences	

Will this course be used to fulfill a requirement for the baccalaureate core?	YES		NO	X

IF YES*, check which core requirements it could be used to fulfill:

O = Oral Intensive, *Format 6 also submitted		W = Writing Intensive, *Format 7 submitted		X = Baccalaureate Core	

4.A ***Is course content related to northern, arctic or circumpolar studies? If yes, a "snowflake" symbol will be added in the printed Catalog, and flagged in Banner.***

YES		NO	X

5. **COURSE REPEATABILITY:**

Is this course repeatable for credit?	YES		NO	X

Justification: Indicate why the course can be repeated (for example, the course follows a different theme each time).	

How many times may the course be repeated for credit?		TIMES

If the course can be repeated with variable credit, what is the maximum number of credit hours that may be earned for this course?		CREDITS

6. <u>COMPLETE</u> CATALOG DESCRIPTION including dept., number, title, credits, credit distribution, cross-listings and/or stacking, clearly showing the changes you want made. (<u>Underline new wording</u> ~~strike through old wording~~ and use complete catalog format including dept., number, title, credits and cross-listed and stacked.)

Example of a <u>complete</u> description:

PS F450 Comparative ~~Aboriginal~~ <u>Indigenous</u> Rights and Policies (s)
3 Credits
Offered As Demand Warrants
~~Case-study~~ <u>Comparative</u> approach ~~in assessing Aboriginal~~ <u>to analyzing Indigenous</u> rights and policies in different nation-state systems. ~~Seven Aboriginal situations~~ <u>Multiple countries and specific policy developments</u> examined for factors promoting or limiting self-determination. Prerequisites: Upper division standing or permission of instructor. (Cross-listed with ANS F450.) (3+0)

CE F463 Groundwater Dynamics

3 Credits
Offered Fall Even-numbered Years

Fundamentals of geohydrology, hydraulics of flow through porous media, well design and hydraulics, and groundwater resources development. Co-requisite CE F344. Stacked with CE F663. (3+0)

7. COMPLETE CATALOG DESCRIPTION AS IT SHOULD APPEAR AFTER ALL CHANGES ARE MADE:

CE F463 Groundwater Dynamics

3 Credits
Offered Fall Even-numbered Years

Fundamentals of geohydrology, hydraulics of flow through porous media, well design and hydraulics, and groundwater resources development. Co-requisite CE F344. Stacked with CE F663. (3+0)

8. *GRADING SYSTEM:* *Specify only one.*

LETTER: [X] PASS/FAIL: [ ]

9. *ESTIMATED IMPACT*

WHAT IMPACT, IF ANY, WILL THIS HAVE ON BUDGET, FACILITIES/SPACE, FACULTY, ETC.

These changes present no negative impacts. The positive impact will be an increased number of technical electives BSCE can choose from to satisfy the requirements of the degree.

10. *LIBRARY COLLECTIONS*

Have you contacted the library collection development officer (kljensen@alaska.edu, 474-6695) with regard to the adequacy of library/media collections, equipment, and services available for the proposed course? If so, give date of contact and resolution. If not, explain why not.

No [X] Yes [ ]

The CEE department has taught this course steadily for decades. The library resources are adequate for the course.

11. *IMPACTS ON PROGRAMS/DEPTS:*

What programs/departments will be affected by this proposed action?
Include information on the Programs/Departments contacted (e.g., email, memo)

No programs/departments will be affected

12. *POSITIVE AND NEGATIVE IMPACTS*

*Please specify **positive and negative** impacts on other courses, programs and departments resulting from the proposed action.*

By stacking the course with CE 463, students seeking a BSCE will have more technical elective options to choose from to satisfy the requirements of the degree.

13. *JUSTIFICATION FOR ACTION REQUESTED*

The purpose of the department and campus-wide curriculum committees is to scrutinize course change and new course applications to make sure that the quality of UAF education is not lowered as a result of the proposed change. Please address this in your response. This section needs to be self-explanatory. If you ask for a change in # of credits, explain why; are you increasing the amount of material covered in the class? If you drop a prerequisite, is it because the material is covered elsewhere? If course is changing to stacked (400/600), explain higher level of effort and performance required on part of students earning graduate credit. Use as much space as needed to fully justify the proposed change and explain what has been done to ensure that the quality of the course is not compromised as a result.

The graduate level course, CE 663 has typically been a well enrolled graduate course, often undergraduate students wish to take the course and apply it towards the BSCE degree as a technical elective. Stacking this course will make it easier for undergraduate students to take the course.

JUSTIFICATION FOR ACTION REQUESTED

The purpose of the department and campus-wide curriculum committees is to scrutinize course change and new course applications to make sure that the quality of UAF education is not lowered as a result of the proposed change. Please address this in your response. This section needs to be self-explanatory. Use as much space as needed to fully justify the proposed course.

The graduate level course, CE 663 has typically been a well enrolled graduate course, often undergraduate students wish to take the course and apply it towards the BSCE degree as a technical elective. Stacking this course will make it easier for undergraduate students to take the course.

APPROVALS: Add additional signature lines as needed.

	Date
Signature, Chair, Program/Department of:	9/24/2015
Signature, Chair, College/School Curriculum Council for:	9-26-15 CEM
Signature, Dean, College/School of:	9/29/15 CEM

Offerings above the level of approved programs must be approved in advance by the Provost.

	Date
Signature of Provost (if above level of approved programs)	

ALL SIGNATURES MUST BE OBTAINED PRIOR TO SUBMISSION TO THE GOVERNANCE OFFICE

	Date
Signature, Chair Faculty Senate Review Committee: ___Curriculum Review ___GAAC ___Core Review ___SADAC	

ADDITIONAL SIGNATURES: (As needed for cross-listing and/or stacking)

	Date
Signature, Chair, Program/Department of:	
Signature, Chair, College/School Curriculum Council for:	
Signature, Dean, College/School of:	

ATTACH COMPLETE SYLLABUS (as part of this application). This list is online at: http://www.uaf.edu/uafgov/faculty-senate/curriculum/course-degree-procedures-/uaf-syllabus-requirements/
The Faculty Senate curriculum committees will review the syllabus to ensure that each of the items listed below are included. If items are missing or unclear, the proposed course (or changes to it) may be denied.

SYLLABUS CHECKLIST FOR ALL UAF COURSES
During the first week of class, instructors will distribute a course syllabus. Although modifications may be made throughout the semester, this document will contain the following information (as applicable to the discipline):

1. Course information:
☑ Title, ☑ number, ☑ credits, ☑ prerequisites, ☑ location, ☑ meeting time (make sure that contact hours are in line with credits).

2. Instructor (and if applicable, Teaching Assistant) information:
☑ Name, ☑ office location, ☑ office hours, ☑ telephone, ☑ email address.

3. Course readings/materials:
☑ Course textbook title, ☑ author, ☑ edition/publisher.
☑ Supplementary readings (indicate whether ☐ required or ☐ recommended) and ☑ any supplies required.

4. Course description:
☑ Content of the course and how it fits into the broader curriculum;
☑ Expected proficiencies required to undertake the course, if applicable.
☑ Inclusion of catalog description is *strongly* recommended, and
☑ Description in syllabus must be consistent with catalog course description.

5. ☑ Course Goals (general), and (see #6)

6. ☑ Student Learning Outcomes (more specific)

7. Instructional methods:
☑ Describe the teaching techniques (eg: lecture, case study, small group discussion, private instruction, studio instruction, values clarification, games, journal writing, use of Blackboard, audio/video conferencing, etc.).

8. Course calendar:
☑ A schedule of class topics and assignments must be included. Be specific so that it is clear that the instructor has thought this through and will not be making it up on the fly (e.g. it is not adequate to say "lab". Instead, give each lab a title that describes its content). You may call the outline Tentative or Work in Progress to allow for modifications during the semester.

9. Course policies:
☑ Specify course rules, including your policies on attendance, tardiness, class participation, make-up exams, and plagiarism/academic integrity.

10. Evaluation:
☑ Specify how students will be evaluated, ☑ what factors will be included, ☑ their relative value, and ☑ how they will be tabulated into grades (on a curve, absolute scores, etc.) ☑ Publicize UAF regulations with regard to the grades of "C" and below as applicable to this course. (Not required in the syllabus, but is a convenient way to publicize this.) Link to PDF summary of grading policy for "C":
http://www.uaf.edu/files/uafgov/Info-to-Publicize-C_Grading-Policy-UPDATED-May-2013.pdf

11. Support Services:
☑ Describe the student support services such as tutoring (local and/or regional) appropriate for the course.

12. Disabilities Services: Note that the phone# and location have been **updated.**
http://www.uaf.edu/disability/ The Office of Disability Services implements the Americans with Disabilities Act (ADA), and ensures that UAF students have equal access to the campus and course materials.

☑ State that you will work with the Office of Disabilities Services (208 WHITAKER BLDG, 474-5655)to provide reasonable accommodation to students with disabilities.

CE 463 – Groundwater Dynamics
Fall 2016

General:

Meeting Time	TBD (3 hours per week)
Location	TBD
Credits	3+0
Co - requisites	CE 344, Water Resouces
Instructor	Dr. David L. Barnes, P.E.
Office	263 Duckering
Phone	474-6126
Email	dlbarnes@alaska.edu
Office Hours	11:45am to 1:00pm MW, 3:00 to 4:00pm T

Course Description: This course will focus on the engineering aspects of groundwater hydrology. The 2016-2017 UAF catalog has the following description of this course "fundamentals of geohydrology, hydraulics of flow through porous media, well design and hydraulics, and groundwater resources development." While each of these topics will be covered during the semester, we will be emphasizing some of the topics more than others. I will use traditional methods to teach this course (lecture style with classroom discussions). My objective for this course is that by the end of the semester you should be able to:

1. Develop a conceptual model of how fluids flow through porous media subject to different boundary conditions,
2. Understand Darcy's Law and how it applies to flow through porous media,
3. Understand the principles of groundwater investigations, production and management.
4. Mathematically model the movement of fluids through porous media using different analytical solutions to the partial differential equation,
5. Be able to size a groundwater well,
6. Be able to apply the United States Geological Survey (USGS) finite difference model MODFLOW to groundwater flow problems.

Student Learning Outcomes
The following ABET student-learning outcomes apply to this course (ABET letter designators are used in this list:

(a) an ability to apply knowledge of mathematics, science and engineering,
(e) an ability to identify, formulate, and solve engineering problems,
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Texts and References:
Todd, D.K. and L.M. Mays, 2005. *Groundwater Hydrology*. John Wiley & Sons, Hoboken, NJ: 636p.

This is the required text for the course. The text focuses on the principles of the occurrence of groundwater, groundwater flow, investigation, production and management of groundwater. We will also cover groundwater modeling both with analytical models and numerical models. Being able to model flow is a fundamental task in many engineering fields such as water resources engineering and environmental engineering. The textbook chapters to be covered in the order we will be covering them

include: Chapter 1 (Introduction), Chapter 2 (Occurrence of Groundwater), Chapter 3 (Groundwater Movement), Chapter 4 (Groundwater and Well Hydraulics), Chapter 9 (Groundwater Flow Modeling Techniques), Chapter 6 (Groundwater Levels and Environmental Influences), Chapter 5 (Water Wells), Chapter 10 (Management of Groundwater), Chapter 11 (Surface Investigation of Groundwater), Chapter 12 (Subsurface Investigation of Groundwater). You will notice that chapters 9 and 5 are out of sequence. I will be assigning a numerical modeling project that will take some time to complete. Hence, I felt it was important to cover the material in Chapter 9 early enough in the semester to provide you the necessary knowledge to complete the project. Chapter 5 contains somewhat standalone material. I placed the chapter towards the end of the semester. I may also be supplementing the text with other published material that covers material that may not be fully covered in the text.

Class Assignments: You are responsible for reading material that I assign. As we work through the semester, I am going to assume that you have read the material and you are ready for discussion on the material during class. I will make every attempt to handout assignments on the day that we start discussing the material covered in the assignment. I encourage you to start working on these problems soon after they are assigned. The project this semester is a modeling project that is designed to teach you how to use the USGS model MODFLOW.

I want you to take pride in your work. How you present solutions to technical problems says a lot about you as a professional. To this end, I expect all of your problem solutions to be done in a professional manner. Solutions that are presented in a professional manner are much easier for me to follow, which means I am more likely to give partial credit on incorrect solutions that are readable.

Class Exams: There will be two exams this semester. The first exam should cover the following topics: basic concepts (Chapter 1) physical properties (Chapter 2), and principles of flow (Chapter 3). The final exam will cover, groundwater and well hydraulics (Chapter 4), water wells (Chapter 5), groundwater levels and environmental influences (Chapter 6), and fundamentals on management and measurements from chapters 10, 11, and 12.

Grading:

Class assignments = *35%*
Project = *15%*
Exams = *50%*

I will use the plus/minus grading system in this class. I will grade on a curve if necessary. This is a stacked class with the graduate course CE 663. To distinguish between the level of efforts expected between undergraduate students and graduate students I will assign addition problems on each problem set to the graduate students. I will also be assigning graduate students an additional project. Finally, I will write the midterm and final exams at a level of effort that is appropriate for the two different levels of students.

Tentative Class Schedule:

Week 1: Introduction and aquifer properties (*Problem set 1 assigned*)
Week 2: Porous media and capillarity (*Problem set 2 assigned*)

Week 3 Water saturation (*Problem set 3 assigned*)
Week 4: Aquifer types and aquifer storage
Week 5: Darcy's Law and hydraulic gradient (*Problem set 4 assigned*)
Week 6: Heterogeneities
Week 7: Unsaturated flow (*exam 1*)
Week 8: The groundwater flow equation and numerical modeling
Week 9: Steady flow in confined aquifers (*Problem set 5 assigned*)
Week 10: Steady flow in unconfined aquifers
Week 11: Radial flow (*Problem set 6 assigned*)
Week 12: Modflow (*Project assigned*)
Week 13: Transient flow (*Problem set 7 assigned*)
Week 14: Flow near aquifer boundaries (*Problem set 8 assigned*)
Week 15: Water well design
Week 16: Environmental influences and field methods (*Exam 2*)

Academic Integrity: I expect you to follow the University of Alaska Fairbanks honor code. You can find the honor code at the following URL address: http://www.uaf.edu/catalog/current/undergrad/regs3.html

Disabilities Services
The Office of Disability Services implements the Americans with Disability Act (ADA), and insures that UAF students have equal access to the campus and course materials. If you require the services of this office, please contact me and I work with them to provide you reasonable accommodation.

Graduate Syllabus

CE 663 – Groundwater Dynamics
Fall 2016

General:	Meeting Time	TBD
	Location	TBD
	Credits	3+0
	Prerequisites	Instructor permission
	Instructor	Dr. David L. Barnes, P.E.
	Office	263 Duckering
	Phone	474-6126
	Email	dlbarnes@alaska.edu
	Office Hours	MW 11:45am to 1:00pm, T 4:00pm to 5:00pm or by appointment

Course Description: This course will focus on the engineering aspects of groundwater hydrology. The 2014-2015 UAF catalog has the following description of this course "fundamentals of geohydrology, hydraulics of flow through porous media, well hydraulics, groundwater pollution, and groundwater resources development." While each of these topics will be covered during the semester, we will be emphasizing some of the topics more than others. I will use traditional methods to teach this course (lecture style with classroom discussions). We will also have one season outside of our regular class time to work on numerical modeling. I have typically taught this session on Friday afternoon sometime after the first exam. My objective for this course is that by the end of the semester you should be able to:

1. Develop a conceptual model of how fluids flow through porous media subject to different boundary conditions,
2. Understand Darcy's Law and how it applies to flow through porous media,
3. Understand the principles of groundwater investigations, production and management.
4. Mathematically model the movement of fluids through porous media using different analytical solutions to the partial differential equation,
5. Solve the groundwater flow equation by finite difference, and
6. Be able to apply the United States Geological Survey (USGS) finite difference model MODFLOW to groundwater flow problems.

Texts and References:
Todd, D.K. and L.M. Mays, 2005. *Groundwater Hydrology*. John Wiley & Sons, Hoboken, NJ: 636p.

This is the required text for the course. The text focuses on the principles of the occurrence of groundwater, groundwater flow, investigation, production and management of groundwater. We will also cover groundwater modeling both with analytical models and numerical models. Being able to model flow is a fundamental task in many engineering fields such as water resources engineering and environmental engineering. The textbook chapters to be covered in the order we will be covering them include: Chapter 1 (Introduction), Chapter 2 (Occurrence of Groundwater), Chapter 3 (Groundwater Movement), Chapter 4 (Groundwater and Well Hydraulics), Chapter 9 (Groundwater Flow Modeling Techniques), Chapter 6 (Groundwater Levels and Environmental Influences), Chapter 5 (Water Wells), Chapter 10 (Management of Groundwater), Chapter 11 (Surface Investigation of Groundwater), Chapter 12 (Subsurface Investigation of Groundwater). You will notice that chapters 9 and 5 are out of sequence. I will be assigning two projects that require material from Chapter 9.

Hence, I felt it was important to cover the material in Chapter 9 early enough in the semester to provide you the necessary knowledge to complete the project. Chapter 5 contains somewhat standalone material. I placed the chapter towards the end of the semester. I may also be supplementing the text with other published material that covers material that may not be fully covered in the text.

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I want you to take pride in your work. How you present solutions to technical problems says a lot about you as a professional. To this end, I expect all of your problem solutions to be done in a professional manner. Solutions that are presented in a professional manner are much easier for me to follow, which means I am more likely to give partial credit on incorrect solutions that are readable.

Class Exams: There will be two exams this semester. The first exam should cover the following topics: basic concepts (Chapter 1) physical properties (Chapter 2), and principles of flow (Chapter 3). The final exam will cover, groundwater and well hydraulics (Chapter 4), water wells (Chapter 5), groundwater levels and environmental influences (Chapter 6), and fundamentals on management and measurements from chapters 10, 11, and 12.

Grading:

Class assignments = *25%*
Project = *25%*
Exams = *50%*

I will use the plus/minus grading system in this class. I will grade on a curve if necessary.

Tentative Class Schedule:

Week 1: Introduction and aquifer properties (*Problem set 1 assigned*)
Week 2: Porous media and capillarity (*Problem set 2 assigned*)
Week 3 Water saturation (*Problem set 3 assigned*)
Week 4: Aquifer types and aquifer storage
Week 5: Darcy's Law and hydraulic gradient (*Problem set 4 assigned*)
Week 6: Heterogeneities
Week 7: Unsaturated flow (*exam 1*)
Week 8: The groundwater flow equation and numerical modeling (*Project 1 assigned*) assigned to graduate students only
Week 9: Steady flow in confined aquifers (*Problem set 5 assigned*)
Week 10: Steady flow in unconfined aquifers
Week 11: Radial flow (*Problem set 6 assigned*)
Week 12: Modflow (*Project 2 assigned*)
Week 13: Transient flow (*Problem set 7 assigned*)
Week 14: Flow near aquifer boundaries (*Problem set 8 assigned*)

Week 15: Water well design
Week 16: Environmental influences and field methods (*Exam 2*)

Academic Integrity: I expect you to follow the University of Alaska Fairbanks honor code. You can find the honor code at the following URL address: http://www.uaf.edu/catalog/current/undergrad/regs3.html

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