ABE 6252: Advanced Soil and Water Management Engineering

Fall 2016
Credits: 3

Catalog Description:

Physical and mathematical analysis of problems in infiltration, drainage, and groundwater hydraulics.

Pre-requisites/Co-requisites:

MAP2302: Elementary Differential Equations or equivalent.

Course Objectives:

- Increase competence with both physical and mathematical analysis of problems in infiltration, drainage, and groundwater hydraulics as a tool of science and engineering.
- Discuss complementary structure (physics & math) of theories and models related to water and nutrient flow.
- Broaden professional ability as Agricultural and Biological Engineers.

Instructor:

Richard V. Scholtz, III
Office location: 107 Rogers Hall
Telephone: 352-392-1864 x 107
E-mail address: rscholtz@ufl.edu
Office Hours: MWF 3:00-4:30 PM

Class Materials Required:

Textbook: No official text.

Lecture notes and other handout materials will be provided, as it becomes available, via e-learning at http://elearning.ufl.edu, look under ABE6986 in Canvas.

Material Fees: None.

Class Materials Suggested:

Books: Abramowitz, M. and I. A. Stegun. 1965. *Handbook of Mathematical Functions.* Dover Publications, New York. ISBN-10: 0486612724

Riley, K. F., M. P. Hobson, and S. J. Bence. 1997. *Mathematical Methods for Physics and Engineering*. Cambridge University Press, New York. ISBN-10: 0521890675

Spiegel, M. R. 1965. *Laplace Transforms*. Schaum Publishing Co., New York. ISBN-10: 007060231X

Spiegel, M. R. 1968. *Mathematical Handbook of Formulas and Tables*. Schaum Publishing Co., New York. ISBN-10: 0071795375

David K. Todd and Larry W. Mays. Groundwater Hydrology. Third Edition. John Wiley and Sons, Inc. New York , 636 pp., 2005.

Course Outline:

Format:

Formal lectures develop the theory and methods used in analysis. Example problems are presented in class. Homework will be assigned that requires application of the theory.

Class lectures are designed to stimulate questions, discussion, and even debate on approaches and assumptions. Lectures will cover material from a wide range of references, so it is imperative that students make every effort to attend classes and take good notes. Students are especially encouraged to ask questions during lectures.

The student is expected to manage their time efficiently, and should anticipate spending three times the length of lectures studying outside the classroom. The student should focus on the following: assignments, literature review project, review of notes and lecture materials and suggested readings.

Students will be held responsible for all announcements made in class, which includes any and all changes to this syllabus. Students are expected to attend all lectures and any guest speakers scheduled.

This is a graduate level course, and a certain quality of work is expected of all students Assignments due must be presented in a professional format and all problems must be presented in an orderly fashion. Partial credit will only be awarded for problems were sample calculations are present. No late assignments will be accepted. It is the student's responsibility to insure that they understand all aspects of any assignments not collected.

Research Proposal based on Literature Review – A PowerPoint presentation. 15%

Literature Review – An 8-10 page summary with a detailed bibliography. 20%

Homework Assignments – Due within two weeks after each assignment is assigned. 65%.

Timeline:

1. Introduction
2. Mathematical Preliminaries
2.1 Vector Analysis
2.2 Ordinary Differential Equations
2.3 Partial Differential Equations
3. Fluid Behavior in Circular Capillaries
3.1 Time Derivative
3.2 Navier – Stokes Equation
3.3 Poiseuille Equation
3.4 Capillary Rise
4. Flow Concepts
4.1 Equation of Continuity
4.2 Potential
5. Equations of Flow
5.1 Similar Transport Equations
5.2 Darcy Equation
5.3 Hydraulic Conductivity
5.4 Equation of Continuity for Porous Media
5.5 Saturated Hydraulic Conductivity
5.6 Unsaturated Hydraulic Conductivity
5.7 Unsaturated Hydraulic Conductivity Estimation
6. Plane Flow
6.1 Flow Equation
6.2 Steady Flow
6.3 Transient Flow
7. Radial Flow
7.1 Continuity Equation
7.2 Confined Aquifer
7.3 Unconfined Aquifer
8. Flow in Unsaturated Systems
8.1 Flow Equations
8.2 Absorption
8.3 Infiltration
8.4 Steady Flow To/From a Water Table
9. Solute Transport
9.1 Convective Diffusion
9.2 Coupling Among Processes
9.3 Heterogeneous Kinetics (Two Step)
9.4 Heterogeneous Kinetics (Three Step)
9.5 Modeling of Heterogeneous (Multi-phase) Systems
10. References

Announcement Policy: Students will be held responsible for *all* announcements made in class, which includes *any and all* changes to this syllabus and the course lecture schedule. Students are expected to attend all lectures and any guest speakers scheduled.

Expectations: Attendance is expected. Be professional and show the appropriate curtesy that should represent all University of Florida graduate students. Paying attention, reading the required material, and

mastering the problem sets should result in a successful outcome. The student will get out of this course, what they put into it.

Grading:

Grading Policy:

A:	92-100%
A-:	90-91%
B+:	88-89%
B:	82-87%
B-:	80-81%
C+:	78-79%
C:	72-77%
C-:	70-71%
D+:	68-69%
D:	62-677%
D-:	60-61%
E:	< 60%

Make-up Policy: To make-up an unavoidable class period with prior notification the student will be required to attend one additional seminar. Tardiness will be treated similarly. To make up a missing class without prior notification, or excessive tardiness the student will be required to attend three addition seminars (at least one must be outside the department)

Student Evaluations:

Students are provided with the opportunity to evaluate both the merits of this course and its instructor, and students are encouraged strongly to complete the evaluations and to provide meaningfully feedback for the improvement of this course. Students may complete evaluations after the deadline to withdrawal from the course at http://evaluations.ufl.edu, once the semester' evaluations have opened. Students will be reminded once evaluations are open. Students may also review a summary of past assessments at http://evaluations.ufl.edu/results.

Academic Honesty:

Students will be *strictly held* to the University of Florida's policy on Academic Honesty. Any act of cheating, plagiarism, or any other dishonest act will be prosecuted to the fullest extent. Students should also strive to think and act as professionals. Students should extend all guests professional and common courtesy.

In the process of enrolling and registering for classes at the University of Florida, every student has signed and presumably understands the following statement: "I understand that the University of Florida expects its students to be honest in all their academic work. I agree to adhere to this commitment to academic honesty and understand that failure to comply with this commitment may result in disciplinary action up to and including expulsion from the University." The following information will be placed on examinations. On my honor, I have neither given nor received unauthorized aid on this examination.

Use of Library, Personal References, PC Programs and Electronic Databases:

These items are university property and should be utilized with other users in mind. Never remove, mark, modify nor deface resources that do not belong to you. If you're in the habit of underlining text, do it only on your personal copy. It is inconsiderate, costly to others, and dishonest to use common references otherwise.

Software Use:

All faculty, staff and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.

UF Counseling Services:

Resources are available on-campus for students having personal problems or lacking clear career and academic goals which interfere with their academic performance. These resources include:

1. University Counseling Center, 301 Peabody Hall, 392-1575, personal and career counseling;
2. Student Mental Health, Student Health Care Center, 392-1171, personal counseling;
3. Center for Sexual Assault/Abuse Recovery and Education (CARE), Student Health Care Center, 392-1161, sexual assault counseling;
4. Career Resource Center, Reitz Union, 392-1601, career development assistance and counseling.
