ERTH656 -- Groundwater Modeling (also offered as CEE623)

Prerequisite: ERTH455 (or similar courses) or instructor consent
Instructor: Aly El-Kadi, POST 709, 956-6331, elkadi@hawaii.edu

Extra Readings: List of textbooks
http://www.bing.com/images/search?q=groundwater+modeling+textbooks&qpvt=groundwater+modeling+textbooks&FORM=IGRE

Classic textbooks

Course Content
This course emphasizes the practical aspects of modeling, where theory and development are reduced and model applications and limitations are stressed. Case studies are included in the course with hands-on modeling. Students will study the popular Groundwater Modeling Package (GMS; http://www.aquaveo.com/gms). Course synopsis is listed below.
- Math review
- Review of hydrogeological concepts
- Solution techniques
  - Analytical
  - Numerical
  - Finite difference method
  - Finite element method
  - Method of characteristics method
  - Random walk method
- Hands on model use
- Groundwater Modeling System (GMS)
  - MODFLOW
  - MODPATH
  - MT3DMS
  - SEAWAT
  - FEMWATER
- Case studies

ERTH Learning Objectives:
The Department of Earth Sciences has defined 4 and 5 learning objectives for the Masters and Ph.D. degree programs, respectively. For Masters, they are (1) Technical knowledge, (2) Scientific method, (3) Communicate geological knowledge, (4) Employability/Contributions Post-Graduation. For Ph.D., an additional SOL is required, i.e., (5) Expertise in a sub-discipline. This course directly incorporates content relevant to some of those:
- SLO1 - student will learn about the relevance of groundwater hydrology and modeling to the understanding and providing for human needs, and the impacts on society and planet Earth.
- SOL2 - graduates are able to examine construct scientific hypotheses and define and carry out analyses
- SLO3 - student will reconstruct knowledge in a written report (final project).
- SLO5 - in all assignments student will evaluate, interpret, and summarize basic principles to explain complex hydrological phenomena.

Course Goals
This class is aimed at advancing the students' modeling skills, not only for the utilized software, but also for all hydrology related models. Modeling is an important expertise that enhances someone chances for working as either a researcher or a consultant.

Assessment and Grading
Tests and homework assignments are in the form of take-home projects. The final's grade will be based on a report in the form of a technical paper and may include oral presentation by each student.
- Assignments: 40%-50%
- Exams: 50%-60%

Class Format
Most lectures include hands-on model application. Each student will follow the instructor's steps as tutorials are presented and discussed. The aim after a few lectures students will be proficient enough to apply the methods without following the written instructions. It is helpful if students practice with the tutorials before the respective class. The students are given a temporary license to use the software on their own personal computers/laptops.

Class handouts/notes/assignments can be downloaded from http://www.soest.hawaii.edu/GG/FACULTY/aly/GG655_handouts.html

GMS can be downloaded from http://www.aquaveo.com/downloads

Disability Access: If you have a disability and related access needs the Department will make every effort to assist and support you. For confidential services students are encouraged to contact the Office for Students with Disabilities (known as “Kokua”) located on the ground floor (Room 013) of the Queen Lili‘uokalani Center for Student Services: KOKUA Program; 2600 Campus Road; Honolulu, Hawaii 96822 Voice: 956-7511; Email: kokua@hawaii.edu ; URL: http://www.hawaii.edu/kokua

Discrimination: The University of Hawai‘i is committed to providing a learning, working and living environment that promotes personal integrity, civility, and mutual respect and is free of all forms of sex discrimination and gender-based violence, including sexual assault, sexual harassment, gender-based harassment, domestic violence, dating violence, and stalking. If you or someone you know is experiencing any of these, the University has staff and resources on your campus to support and assist you. Staff can also direct you to resources that are in the community. Here are some of your options:

As members of the University faculty, your instructors are required to immediately report any incident of potential sex discrimination or gender-based violence to the campus Title IX Coordinator.

Although the Title IX Coordinator and your instructors cannot guarantee confidentiality, you will still have options about how your case will be handled. Our goal is to make sure you are aware of the range of options available to you and have access to the resources and support you need. If you wish to remain ANONYMOUS, speak with someone CONFIDENTIALLY, or would like to receive information and support in a CONFIDENTIAL setting, use the confidential resources available here:
http://www.manoa.hawaii.edu/titleix/resources.html - confidential

If you wish to directly REPORT an incident of sex discrimination or gender-based violence including sexual assault, sexual harassment, gender-based harassment, domestic violence, dating violence or stalking as well as receive information and support, contact: Dee Uwono Title IX Coordinator (808) 956-2299 t9uhm@hawaii.edu.