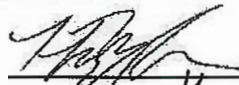

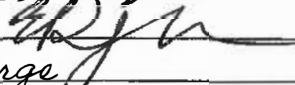
 FLORIDA ATLANTIC UNIVERSITY	COURSE CHANGE REQUEST Undergraduate Programs		UUPC Approval <u>2/26/24</u> UFS Approval _____ SCNS Submittal _____ Confirmed _____ Banner Posted _____ Catalog _____
	Department Department of Geosciences College College of Science		
Current Course Prefix and Number GLY 4832C		Current Course Title Intro to Hydrogeology Modeling & Aquifer Testing	
<i>Syllabus must be attached for ANY changes to current course details. See Template. Please consult and list departments that may be affected by the changes; attach documentation.</i>			
Change title to: Groundwater Numerical Modeling Change prefix From: _____ To: _____ Change course number From: _____ To: _____ Change credits* From: _____ To: _____ Change grading From: _____ To: _____ Change WAC/Gordon Rule status** Add <input type="checkbox"/> Remove <input type="checkbox"/> Change General Education Requirements*** Add <input type="checkbox"/> Remove <input type="checkbox"/> <small>*See Definition of a Credit Hour. **WAC/Gordon Rule criteria must be indicated in syllabus and approval attached to this form. See WAC Guidelines. ***GE criteria must be indicated in syllabus and approval attached to this form. See Intellectual Foundations Guidelines.</small>		Change description to: This course will introduce you to the theory and practice of groundwater modeling, with emphasis on model conceptualization, construction, simulation, calibration using Groundwater Modeling System (GMS), an advanced and popular 3D simulation software for groundwater flow and transport modeling. The class comprises three parts: a rapid overview/review of groundwater mechanics, an introduction to finite-difference methods, and application of GMS. Change prerequisites/minimum grades to: GLY 4822, with a minimum grade of C. Change corequisites to: Change registration controls to: Please list existing and new pre/corequisites, specify AND or OR and include minimum passing grade (default is D-).	
Effective Term/Year for Changes: Fall 2024		Terminate course? Effective Term/Year for Termination:	
Faculty Contact/Email/Phone Xiaolang Zhang / xiaolangzhang@fau.edu / 561-297-3252			
Approved by Department Chair <u></u> College Curriculum Chair <u></u> College Dean <u></u> UUPC Chair <u>Koray Sogut</u> Undergraduate Studies Dean <u>Dan Meeroff</u> UFS President _____ Provost _____		Date 1/31/24 2/15/24 2/16/24 2/26/24 2/26/24	

Email this form and syllabus to mjenning@fau.edu seven business days before the UUPC meeting.

GLY 4832C
Groundwater Numerical Modeling
SE417, Tuesday, 14:00 pm – 16:50 pm
3 credits
Fall 2024

Dr. Xiaolang Zhang
Office hours: Monday, 9:00 – 11:00 am (by appointment)

Email: xiaolangzhang@fau.edu

Course Description

This course will introduce you to the theory and practice of groundwater modeling, with emphasis on model conceptualization, construction, simulation, calibration using Groundwater Modeling System (GMS), an advanced and popular 3D simulation software for groundwater flow and transport modeling. The class comprises three parts: a rapid overview/review of groundwater mechanics, an introduction to finite-difference methods, and application of GMS.

Course Objectives

- To gain basic knowledge of groundwater flow equations and groundwater hydrology.
- To gain basic knowledge of numerical modeling and application of groundwater modeling.

Canvas

This course uses Canvas (<https://canvas.fau.edu>) as a course management system where you will find the course syllabus, announcements, grades, and other course information.

Recommended Text and Materials

Groundwater by Freeze and Cherry, 1979

Wang and Anderson, 1981/1995, Introduction to Groundwater Modeling

More free books related to Hydrogeology: <https://gw-project.org/books/>

Course Prerequisites: *GLY 4822 with a minimum grade of C*

Course Delivery Mode

This is an in-person course in SE413. The course is taught in an active learning format. Time spent in class is centered around reading, group discussions, and seminars.

TECHNOLOGY AND COMPUTER REQUIREMENTS

Computer Requirement - Basic computer specifications for Canvas [Link to Specifications](#)

Operating System

- A computer that can run Mac OSX or Win 7.0 or higher.

Peripherals

- A backup option should be available to minimize the loss of work. This can be an external hard drive, a USB drive, cloud storage, or your folder on the FAU servers.

Software

- Once logged in to Canvas make sure your Internet browser is compatible.

Technical Support

If a problem occurs, it is essential you take immediate action to document the issue so your instructor can verify and take appropriate action to resolve the problem. Please take the following steps when a problem occurs:

****Most issues in Canvas can be resolved by clicking on the “Help” tab on the menu bar. ****

By clicking the “Help” tab you will be able to:

- Report a Problem
- Search Canvas Guides

1. Complete a Help Desk ticket [Link to Help Desk](#). Make sure you complete the form entirely and give a full description of your problem so the Help Desk staff will have the pertinent information in order to assist you properly. This includes:
 - a. Select “Canvas (Student)” for the Ticket Type.
 - b. Input the Course ID.
 - c. In the Summary/Additional Details section, include your operating system, Internet browser, and Internet service provider (ISP).
 - d. Attach the Print Screen file, if available.
2. If you do not hear back from the Help Desk within a timely manner (48 hours), it is your responsibility to follow up with the appropriate person until a resolution is obtained.
3. Once you have submitted a Help Desk Ticket, inform your instructor. Include all pertinent information of the incident (3b-d above). Keep your instructor informed of the status.

COURSE ASSESSMENTS, ASSIGNMENTS, GRADING POLICY, AND COURSE POLICIES

Course Structure

The course is taught in an active learning format.

Course Evaluation

Six homework/modeling exercises are mandatory. You will be provided with class time to initiate the modeling assignment. However, post-class, you are responsible for completing it independently and submitting your modeling results.

Paper critique assignment:

We will read papers on groundwater modeling as part of the class. Please start looking at current and back issues of *Groundwater*, *Water Resources Research*, *Journal of Hydrology*, *Hydrogeology Journal*, and other peer-reviewed journals that publish articles on groundwater modeling. Select one paper to critique by **11/5**. Please check with me after making a preliminary selection, to make sure that the topic and level is appropriate, then send me a PDF (or a link to a PDF) of the paper to post at the class website so that the rest of the class can also read the paper before you present your critique. Prepare a critical evaluation of the paper. This is not just a summary of the paper, although that should be included. Your critique should focus on methodology, assumptions, utility, and implications of the published work. Your written critique should comprise no more than 5-6 pages of text. Please also be ready to present this critique to the class and discuss with your colleagues. Paper critiques will be presented to the class and turned in on **12/3 and/or 12/5**.

<u>Assessment</u>	<u>Points</u>	<u>Percent</u>
Assignments	600 points	60%
Paper critique	400 points	40%
<hr/>		
TOTAL	1000 points	100%

Grading

Letter grades will be assigned based on total points as follows:

940-1000 : A	900-939 : A-	
870-899 : B ⁺	840-869 : B	800-839 : B-
770-799 : C ⁺	740-769 : C	700-739 : C-
670-699 : D ⁺	640-669 : D	600-639 : D-
< 600 : F		

No individual extra credit will be given.

Grades will be posted to Canvas. You should also keep a record of your own grades earned in this course. Incomplete grades will be given only when a student is unable to complete the course within the semester due to unforeseen circumstances, with a considerable impact on the student's life, and beyond the student's control. An incomplete or "I" grade shall ONLY be given for the reasons listed and under the conditions specified in the FAU course catalog (<http://www.fau.edu/academic/registrar/catalog/academics.php>).

NOTE: No make-up assignments, examinations or grade disputes will be considered after the last day of classes specified by FAU. The only exception to this will be the use of "Reading Days" in the case of emergencies or approved documentation for missing the final exam in the case of an emergency.

Code of Academic Integrity Policy Statement

Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty is considered a serious breach of these ethical standards, because it interferes with the university's mission to provide a high-quality education in which no student enjoys an unfair advantage over any other. Academic dishonesty is also destructive of the university

community, which is grounded in a system of mutual trust and places high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. For more information, see [University Regulation 4.001](#).

Attendance

Students are expected to attend all of their scheduled University classes and to satisfy all academic objectives as outlined by the instructor. The effect of absences upon grades is determined by the instructor, and the University reserves the right to deal at any time with individual cases of non-attendance. Students are responsible for arranging to make up work missed because of legitimate class absence, such as illness, family emergencies, military obligation, court-imposed legal obligations or participation in university approved activities. Examples of University-approved reasons for absences include participating on an athletic or scholastic team, musical and theatrical performances and debate activities. It is the student's responsibility to give the instructor notice prior to any anticipated absences and within a reasonable amount of time after an unanticipated absence, ordinarily by the next scheduled class meeting. Instructors must allow each student who is absent for a university-approved reason the opportunity to make up work missed without any reduction in the student's final course grade as a direct result of such absence.

Classroom Etiquette/Disruptive Behavior Policy Statement

Disruptive behavior is defined in the FAU Student Code of Conduct as "... *activities which interfere with the educational mission within classroom.*" Students who behave in the face-to-face and/or virtual classroom such that the educational experiences of other students and/or the instructor's course objectives are disrupted are subject to disciplinary action. Such behavior impedes students' ability to learn or an instructor's ability to teach. Disruptive behavior may include but is not limited to: non-approved use of electronic devices (including cellular telephones); cursing or shouting at others in such a way as to be disruptive; or, other violations of an instructor's expectations for classroom conduct.

For more information, please see the FAU Office of Student Conduct: [Link to Student Conduct Policy](#)

COMMUNICATION POLICY

Correspondence Policy:

- For more efficient email correspondences, please include your course number in the subject line of all email correspondences ([GLY6934](#) or [GEO4930](#))
- For questions regarding the course schedule, grading, expectations, etc., first review the [syllabus](#) for the requested information.
 - FAU student privacy policy prohibits discussion of individual grades via email; a virtual office visit is required.
- Please use your FAU account when emailing; otherwise, an unrecognizable email account may be deemed junk or spam (and not read).
- **Under State of Florida law, all e-mails to or from FAU are public records. Do not say anything in an e-mail you would not want to see in a newspaper, etc.**

Instructor's Plan for Classroom Response Time & Feedback

- Email Policy: Except for Saturdays, Sundays, and holidays, instructor typically, will respond to messages within 48 hours.
- Assignment Feedback Policy: Feedback will be provided on submitted assignments within one week of the submission date. Some assignments may require a longer review period, which will be communicated to students by the instructor.
- Course-Related Questions: Except Saturdays, Sundays, and holidays, questions will, generally, be answered by instructors within 48 hours.

SELECTED UNIVERSITY AND COLLEGE POLICIES

Disability Policy Statement

In compliance with the Americans with Disabilities Act Amendments Act (ADAAA), students who require reasonable accommodations due to a disability to properly execute coursework must register with Student Accessibility Services (SAS) and follow all SAS procedures. SAS has offices across three of FAU's campuses – Boca Raton, Davie and Jupiter – however disability services are available for students on all campuses. For more information, please visit the SAS website at www.fau.edu/sas/.

Counseling and Psychological Services (CAPS) Center

Life as a university student can be challenging physically, mentally and emotionally. Students who find stress negatively affecting their ability to achieve academic or personal goals may wish to consider utilizing FAU's Counseling and Psychological Services (CAPS) Center. CAPS provides FAU students a range of services – individual counseling, support meetings, and psychiatric services, to name a few – offered to help improve and maintain emotional well-being. For more information, go to <http://www.fau.edu/counseling/>

Note on course credit and expected workload

FAU policy grants one semester hour of credit for every hour of (weekly) meeting time for *lecture* courses. As a general rule, students are expected to spend two hours per credit working outside of class. Work outside of this class will consist of class preparation, supplemental reading, group project work, writing assignments, field trips, studying for and taking exams, and completion of other activities assigned by the instructor.

Drops/Withdrawals

Students are responsible for completing the process of dropping or withdrawing from a course. Please click on the following link for more information on dropping and/or withdrawing from a course. [Link to FAU Registrar Office](#)

COURSE SCHEDULE

A tentative course schedule is provided. The instructor reserves the right to make changes in the class and course schedule during the semester as necessary for the smooth functioning of the class.

You are strongly encouraged to check Canvas frequently for the most current course schedule.

Week	Date	Topic	Homework
1	21-Aug	Physical hydrogeology review: water and soil properties, Darcy's law, types of aquifers aquifer properties, heads and gradients.	Review syllabus
2	28-Aug	Effective properties for flow along and across layers, conservation of mass, confined versus unconfined flow, analytical solutions, finite differences: one-dimensional flow at steady state	<ul style="list-style-type: none"> Lecture • Lab Practice
3	4-Sep	<i>Labor Day, no class</i>	<ul style="list-style-type: none"> Lecture • Lab Practice
4	11-Sep	Introduction, conceptual models, boundary conditions	<ul style="list-style-type: none"> Lecture • Lab Practice
5	18-Sep	Finite difference theory and grid design	<ul style="list-style-type: none"> Lecture • Lab Practice
6	25-Sep	Intro to MODFLOW: MODFLOW stress packages; streams, lakes, reservoirs, wetlands; solvers, vector representations of flow	<ul style="list-style-type: none"> Lecture • Lab Practice
7	2-Oct	MODFLOW in two dimensions, transient response to pumping	<ul style="list-style-type: none"> Lecture • Lab Practice
8	9-Oct	MODFLOW case studies and discussion1	<ul style="list-style-type: none"> Lecture • Lab Practice
9	16-Oct	MODFLOW case studies and discussion2	<ul style="list-style-type: none"> Lecture • Lab Practice
10	23-Oct	MODFLOW case studies and discussion3	<ul style="list-style-type: none"> Lecture • Lab Practice
11	30-Oct	MODFLOW case studies and discussion4	<ul style="list-style-type: none"> Lecture • Lab Practice
12	06-Nov	MODFLOW case studies and discussion5	<ul style="list-style-type: none"> Lecture • Lab Practice
13	13-Nov	MODFLOW case studies and discussion6	<ul style="list-style-type: none"> Lecture • Lab Practice
14	20-Nov	MODFLOW case studies and discussion7	<ul style="list-style-type: none"> Lecture • Lab Practice
15	27-Nov	<i>Present paper critiques and final projects, discussion</i>	<ul style="list-style-type: none"> read papers, write/present critiques