

**Training and Development Opportunity – USGS Office of Organizational and Employee Development (OED) - National Training Center (NTC)**

**Course Title: Advanced Modeling of Groundwater Flow**

**Course Number: GW3099**

**Date: September 16-20, 2024**

**Location: Boise, Idaho, Idaho Water Science Center**

**Start: Monday, September 16th at 8:30 am**

**End: Friday, September 20st at 4:00 pm**

**Course Registration Deadline Date: Friday, August 30, 2024**

**Course Developers:**

**Joseph Hughes** [**jdhughes@usgs.gov**](mailto:jdhughes@usgs.gov) **312-521-0740**

**(For course related questions, please contact Joseph Hughes)**

**Tuition: USGS: $1045 Non USGS: $1045**

**Course Description:**

This 5-day course class will cover the advanced capabilities available in MODFLOW 6 and PEST++. The class will focus on 1) advanced capabilities such as unstructured grids, local grid refinement, and XT3D; 2) use of the advanced stress packages; 3) solute transport, including variable-density groundwater flow and transport; 4) energy transport; 5) particle tracking; 6) use of the MODFLOW API to interactively control MODFLOW execution at runtime; 7) surface-water/groundwater interactions with pywatershed and MODFLOW; 8) surface-water flow; 9) running parallel MODFLOW 6 simulations; and 10) parameter estimation and uncertainty analysis using PEST++. The class will be taught using Python, FloPy, and Jupyter Notebooks. In addition to lectures on the advanced capabilities, most sessions will include in-class exercises to give attendees a better understanding of how to use the modeling tools.

A tentative course outline is provided at the end of this announcement.

**Course Attendees:**

The course is open to all USGS hydrologists involved in current or future projects that require the application of one or more of the capabilities that extend beyond the core MODFLOW 6 Models and Packages. Cooperators may attend if sponsored by a local USGS office.

Maximum number of students is 25

**Course Prerequisites:**

Attendees should have taken GW2096, “Modeling of Groundwater Flow with MODFLOW,” or have equivalent experience in applying MODFLOW. Attendees also should have familiarity with Python, FloPy, and Jupyter Notebooks.

**OED-NTC Contacts:**

Staci Unruh – 303-445-4667 - [sdunruh@usgs.gov](mailto:sdunruh@usgs.gov) or the Operation Support Services (OSS) Team at 303-445-4693 - [oedoss@usgs.gov](mailto:oedoss@usgs.gov)

**DOI LEARN REGISTRATION INSTRUCTIONS:**

**ALL DOI CLASS REGISTRATION MUST BE COMPLETED IN DOI LEARN**

DOI LEARN – The Department-wide Learning Management System (LMS)

If you have never logged into DOI LEARN, please first visit the DOI LEARN Portal Page for detailed instructions:

<http://www.doi.gov/doilearn/index.cfm>

If you do not know if you have an existing account, or have forgotten your username and/or password, please contact the DOI LEARN Help Desk at:

866-466-1998 or [doilearn@sumtotalsystems.com](mailto:doilearn@sumtotalsystems.com)

To learn more about DOI LEARN, see FAQs and How-to Tutorials, please visit the Employee and Career Development tab on the Human Capital Website:

<http://www.usgs.gov/humancapital/ecd/ecd_trainingdoi.html>

If you have any DOI LEARN questions, email:

[oeddoilearn@usgs.gov](mailto:oeddoilearn@usgs.gov) for assistance.

**DOI LEARN Class Registration Instructions:**

1. Go to the DOI LEARN Portal Page at: http://www.doi.gov/doilearn/index.cfm
2. Click on “Have an Account? Login Here” on the right side of the screen and enter your username and password.
3. Once logged in, first verify your Profile is set up correctly, including your time zone and assigned supervisor(s). Under the “My Home” tab, click on “Update My Profile,” “Update My Supervisor,” and/or “Update My Time Zone” then click on “My Profile” and update as needed. **If** any changes were made click “Save” and then click on “Close Record.”
4. While still under the “My Home” tab, click on “Search the Catalog” and “Register for a Course.”
5. The new catalog page appears. Click on, “Click here to continue on to the Catalog.” NOTE: this area will be updated as changes are made to the system; and wording and links may be different at this step than described here.
6. Once you are in the catalog, in the “Search For:” field, enter the exact course title and click “Go” . . . . . the Advanced Search option is also available for a more specific search on the course code, description, etc.
7. If more than one course appears, scroll through the list until you find the course you are looking for. NOTE: there may be multiple pages.
8. Click on the “Details” tab for general course information. Click on the “Scheduled Classes” tab for specific class information and “Enroll” when ready. If supervisor approval is required, you must first select the scheduled class, click on “Submit Request” and then click “Begin” to go to the Learning Request form. Complete and click “Submit.” An auto-generated email will be sent to the supervisor listed in your profile asking them to approve using the Approval Manager.

If supervisor approval is not required, simply select the scheduled class you wish to attend and click on “Enroll in this Class.” NOTE: In both situations, an auto-generated email is sent to you and your assigned supervisor(s) with detailed information. If you did not have the correct supervisor(s) assigned, the auto-generated email cannot be resent and you must then update your profile and verbally notify the correct supervisor(s) that you need a Learning Request handled. NOTE: if you are not seeing any scheduled classes to enroll in, please go back to the “Details” tab and see who is listed under “Contact” for additional information.

1. To check the status of your pending learning request(s) or to see what classes you have self-enrolled in, go to the “My Home” tab and click into “View My Training Requests” and/or “Access My Elective Training” areas. If you or your supervisor(s) are unsure on how to complete any of these steps, please visit our FAQs and How-to Tutorials on the Employee and Career Development tab of the Human website:

<http://www.usgs.gov/humancapital/ecd/ecd_trainingdoi.html>

**Registration Instructions for Non DOI, Other Federal Agencies and Cooperators:**

Some scheduled classes are available to non-USGS personnel on a space available basis. Non Department of Interior (DOI) personnel, Other Federal Agencies (OFAs), State and Local Government Agencies, and American and Alaska Tribal Governments must complete a non DOI course application at the following link:

http://www.usgs.gov/humancapital/documents/NonUSGSApplicationForm.pdf.

USGS Cooperators may attend ifspace is available. Employees of private companies and/or consultants are eligible to attend only if they meet the status of a cooperator as verified by the host USGS office.

A USGS Cooperator must have a current Memorandum of Agreement (MOA), or a current Memorandum of Understanding (MOU), or be currentlyworking on a Joint Funding Agreement (JFA) with a USGS office. Approval steps for a Cooperator include:

1. Verification of agreement and approval of attendance from the partnering USGS Office and local WSC Office sent to OED, Staci Unruh, sdunruh@usgs.gov.
2. A completed non DOI registration form which can be accessed at the following URL: http://www.usgs.gov/humancapital/documents/NonUSGSApplicationForm.pdf. Email or fax to OED, Attn: Staci Unruh [sdunruh@usgs.gov](mailto:sdunruh@usgs.gov) or 303-445-4667.

After these documents are received and approved, the USGS course developer will make the final selection of class participants.

Students are encouraged to bring a laptop computer to this course. It is the student’s responsibility to contact their local IT staff to have a user account ID added to their laptop **BEFORE** traveling to the class. If your local IT person has any questions, please have them to contact the OED IT Specialist, Patty Gonwa, [pmgonwa@usgs.gov](mailto:pmgonwa@usgs.gov) or 303-445-4680 for assistance.

**Advanced Modeling of**

**Groundwater Flow**

**GW3099**

**September 16-20, 2024**

**Tentative Course Outline**

*Begin at 8:30 am, Monday*

Monday: FloPy Overview; Unstructured Grids (DISV, DISU) and Local Grid Refinement (LGR); XT3D; Advanced Flow Packages (LAK, MAW, MVR, SFR, UZF)

Tuesday: Skeletal Storage, Compaction, and Subsidence (CSUB) Package; Groundwater Solute Transport (GWT) and associated advanced package (SFT, UZT, etc.); Buoyancy (BUY) and Viscosity (VSC); Groundwater Energy Transport (GWE) and associated advanced packages (SFE, UZE, etc.)

Wednesday: Solver settings; Particle Tracking (PRT); MODFLOW Application Programming Interface (API)

Thursday: pywatershed; MODFLOW API (coupling models); Surface Water Flow (SWF); Parallel MODFLOW

Friday: PEST++; Advanced Visualization; Wrap-Up

*Adjourn at 3:45 pm, Friday*

**Instructors:**

Wes Bonelli (UCAR)

Mike Fienen

Joseph Hughes

Christian Langevin

James McCreight (UCAR)

Eric Morway

Alden Provost

Michael Reno (UCAR)