Office of the President
California State University, Chico

Executive Memorandum 18-028

October 11, 2018

From: Gayle E. Hutchinson, President

Subject: Discontinuation of the Certificate in Hydrogeology

Upon the recommendation of the Academic Senate, with the concurrence of the Provost, I approve the discontinuation of the Certificate in Hydrogeology within the Department of Geological and Environmental Sciences, College of Natural Sciences, effective fall 2019.

Policy Title:	EM 18-028 Discontinuation of the Certificate in Hydrogeology
Contact:	Department of Geological and Environmental Sciences
Supersedes:	
Revision:	
Enabling Legislation or Executive Order:	

Discontinue Undergraduate Program: See EM 15-005

Program Name: Hydrogeology Certificate

Complete only if applicable
Program named above is:

___ Option within _____
(degree program name)

___ Minor

_X_ Certificate

Rationale:
Certificate does not impact graduation, employment, or potential for graduate school. Students have complained that it is leads to false expectations. The department voted unanimously to discontinue the certificate and improve advising.

Required Signatures

The Department of Geological and Environmental Sciences
has reviewed and approved this program discontinuation.

_____ 12/5/17
Chair, Department Curriculum Committee Date

_____ 12/5/17
Department Chair Date

The College of Natural Sciences
has reviewed and approved this program discontinuation.

_____ Feb 13 2018
Chair, College Curriculum Committee Date

_____ MAR 1 2 2018
College Dean

Send signature page with proposal attached to Curriculum Services at Undergraduate Education, zip 128

Curriculum Review Completed 8/20/18

CSU Chico
Curriculum Services
MAR 1 2 2018
RECEIVED

Discontinue Undergraduate Program: See EM 15-005

Date 12/5/2017

Description and History of the Program:

The Certificate in Hydrogeology was first offered in the 2007-2009 catalog. Since the certificate was offered, there is no record of a single student completing the certificate. One student applied, but there is no record of completion. The original intent of the certificate was to guide Geology majors through the electives that would most benefit them toward achieving a professional State of California certificate in Hydrogeology. The state certificate follows receive a professional licensure as a Registered Geologist. The certificate does not impact any other programs or goals. We are not aware of any other similar certificate in the CSU. In the view of the state licensing board, there are a series of critical courses needed to obtain the class background to register as a geologist and an exam is used to receive the official Certificate in Hydrogeology. No university certificate is required.

Currently, the certificate is active but no students are actively working towards the certificate. In general, students who show an interest in becoming a professional geologist are advised to direct their electives toward certain courses that align with state expectations. It is our belief that advising is more important than a certificate.

Indicate areas of concern, with reference to the above history, as it pertains to the proposed discontinuation.

The major concern and the reason to request discontinuing the certificate is that we believe the certificate provides false hope to students toward achieving professional licensure. The catalog states, "This certificate provides Geology majors with the information and skills necessary to become certified hydrogeologists in the state of California." However, the registration as a professional geologist and the certificate are based on exams as well as post-graduation experience apprenticing with a registered geologist. The courses are not likely to provide the statutory and regulatory information needed to pass those exams. Discontinuing the certificate should not adversely impact students striving toward their goal of professional licensure or course availability as those courses will still be offered as electives in the B.S. Geology as well as the B.S. Environmental Science in the Option of Hydrology.

Describe the consultation process and procedures:

The discussion of discontinuing the certificate has been ongoing since at least 2006 when it was openly stated that students pursuing a California certificate in hydrology would not be prepared with our certificate in Hydrogeology.

The issue was formally discussed at the GEOS Department Advisory Committee meeting on April 18, 2015. The board also agreed that the certificate should be discontinued as it had no merit outside of the university.

Discontinue Undergraduate Program: See EM 15-005

The cancellation of the certificate was discussed at several department meetings in 2016 and 2017 and was formally placed on the agenda for a vote on November 3, 2017. The department voted unanimously for its cancellation.

May 23, 2006

EXECUTIVE MEMORANDUM

06-22

From: Paul J. Zingg, President

Subject: Executive Memorandum 06-22, **Approval for a New Certificate in Hydrogeology**

Upon the recommendation of the Academic Senate and with the concurrence of the Provost, I approve a new Certificate in Hydrogeology within the Department of Geological and Environmental Sciences, College of Natural Sciences, effective fall 2007. The number of units required for the certificate will be 26 units.

Undergraduate New Certificate Program

Checklist/Routing and Signature Form (PDF)

Please print this form and attach it to the front of the proposal

Proposed Certificate Name:	Certificate in Hydrogeology
Department+ZIP:	Geological and Environmental Sciences/205
College+ZIP:	College of Natural Sciences/555
Department Contact(s):	Karin Hoover
Phone#:	x6269
E-mail:	khoover@csuchico.edu

	CONCEPTUAL ABSTRACT STEPS:	COMPLETED:
1.	Conceptual Abstract developed by Department	Date: 14 OCT 05
2.	Conceptual Abstract reviewed and approved by Department Curriculum Committee	Date: 21 Oct 05
3.	Conceptual Abstract reviewed and approved by Department Chair	Date: 31 Oct 05
4.	Conceptual Abstract reviewed and approved by College Curriculum Committee	Date: 12/7/05
5.	Conceptual Abstract reviewed and approved by College Dean	Date: 12/9/05
6.	Conceptual Abstract reviewed and Approved by Vice Provost for Academic Affairs	Date:

	PROPOSAL STEPS:	COMPLETED:
1.	**Proposal/Rationale Developed by Department**	Date: 21 Oct 05
2.	**Reviewed and approved by Department Curriculum Committee**	Date: 31 Oct 05
	Signature of Chair, Department Curriculum Committee: Gina Johnston	
3.	**Reviewed and approved by Department Chair**	Date: 2 Nov 05
	Signature of Department Chair: Richard A Ray	
4.	**Reviewed and approved by College Curriculum Committee**	Date: 12/7/05
	Signature of Chair, College Curriculum Committee: David B Bull	
5.	**Reviewed and approved by College Dean**	Date: 12/9/05
	Signature of College Dean: Margaret A Quinn	
6.	**Original plus 2 copies of proposal sent to Academic Affairs Campus Zip 110 ATTN: Bitsy Easley**	Date: 2/06
7.	**Technical Review**	Date: 3/06

Note: remainder of approval process (e.g., EPPC/Academic Senate) on database. Departments will be notified of dates for EPPC and Academic Senate review and number of copies needed.

1. Name of the Department and College submitting the proposal and full and exact title of the proposed certificate.

Department of Geological and Environmental Sciences in the College of Natural Sciences

Certificate in Hydrogeology

Academic year of intended implementation.

Fall 2007

Identify the unit which will have primary responsibility.

Department of Geological and Environmental Sciences

2. Definition of the proposed certificate with a brief summary of the objectives.

The Department of Geological and Environmental Sciences at CSU, Chico offers a B.S. degree in Geology and an option in Hydrology under the B.S. degree in Geosciences (this option is being moved to the BS in Environmental Sciences in Fall 2007). These majors are designed to prepare students for entry-level positions within their chosen field or to pursue advanced degrees. Students anticipating becoming licensed as a Certified Hydrogeologist in the State of California must also be licensed as a Registered Geologist prior to certification. To qualify as a Registered Geologist in the State of California requires graduation with a major in geology or the completion of 30 semester units in geological science courses leading to a major in geology, of which at least 24 units are upper division or graduate courses. We are proposing to create a Certificate in Hydrogeology to provide geology majors with the information and skills necessary to become a Certified Hydrogeologist in the State of California.

3. Total number of units required for certificate: 26 units

List of all existing courses to be specifically required for certificate:

Catalog number	Title	Units of credit
GEOS 250	Computer Applications	1
GEOS 270	California Water	2
GEOS 380	Hydrology	3
GEOS 381	Hydrologic Field Methods	2
GEOS 390	Surficial Processes	3
GEOS 415	Hydrogeology	3
GEOS 460	Water Resources Management	3
GEOS 530	Environmental Systems Modeling	3
GEOS 545	Applied Geophysics	3
GEOS 565	Geochemistry (optional)	3

Indicate mode of delivery for courses if other than regular (e.g., distance, cooperative, intercampus, etc.).

7. List of all new courses to be required for the proposed program: The course described below is actually one option of a choice of two courses.

Catalog number	Title	Units of credit
GEOS 516	Natural Water Systems	3

If appropriate, identify those new courses:

- Needed to initiate the program.
- Needed during the first two years after implementation.

Include proposed catalog description of all new courses.

GEOS 516 Natural Water Systems 3 EvnFA

Prerequisites: GEOS 415.

Fundamentals of processes in environmental aquatic systems emphasizing acid-base and pE-pH relationships, solubility of carbon species in natural waters, and interactions at the solid-liquid interface.

Indicate mode of delivery for courses if other than regular (e.g., distance, cooperative, intercampus, etc.).

4. Description of elective courses, which can be used to satisfy requirements for the certificate.

Same detail as for required courses

Note: Proposal should take advantage of courses already offered in other departments when subject matter would otherwise overlap or duplicate existing course content.

5. Other course prerequisites (if applicable)

Special criteria for admission and/or continuation (if applicable)

6. Explain any special program characteristics (e.g., terminology, credit units required, types of coursework, etc.)

6a. Indicate mode of delivery for the program's courses if other than regular (e.g., distance, cooperative, intercampus, etc.)

7. Explain provisions for articulation of the proposed certificate with community college courses

The proposed Certificate in Hydrogeology comprises 2 lower-division courses and 8 upper-division courses. It is possible that students may complete the equivalent of the required lower-division courses at a community college.

8. Specify how this proposed certificate supports the University Strategic Plan.

This proposed option fits within the Strategic Plan in a number of ways. The proposed Certificate in Hydrogeology demonstrates our commitment to continue developing high quality and relevant learning environments. The proposed courses in the certificate will provide students with the opportunity to make use of current and new technologies.

9. Identify other closely related curricula currently offered by the campus

The Department of Geological and Environmental Sciences at CSU, Chico offers a B.S. degree in Geology and an option in Hydrology under the B.S. degree in Geosciences. These majors are designed to prepare students for entry-level positions within their chosen field or to pursue advanced degrees. However, neither degree by itself is sufficient to prepare geologists to become Certified Hydrogeologists in the State of California. We anticipate that a Certificate in Hydrogeology will attract not only geology majors seeking to enter the field of hydrogeology, but also practicing Registered Geologists who would like refresher courses prior to taking the exam to become a Certified Hydrogeologist. The overall impact should be increased enrollment in the courses required for the certificate.

10. Need for the proposed certificate

In addition to the M.S. degree, the Department of Geology at California State University, Bakersfield offers a post-baccalaureate Certificate in Hydrogeology. The certificate is designed primarily to give professionals additional training in hydrogeology and hydrogeochemistry. Portland State University offers a graduate-level Certificate in Hydrology which leads to professional certification with the American Institute of Hydrology. The Hydrogeology Certificate of Completion offered by the Department of Geosciences at the University of Houston is available to both graduate students and non-degree seeking professionals. This certificate is designed for professionals who wish to be recognized as obtaining a broad background in the area of hydrogeology without completion of an advanced degree. This may include geologists currently working in the petroleum industry who wish to obtain positions in the environmental industry, as well as those with hydrogeology positions but lacking formal course work in that area. The University of Massachusetts, Boston offers a nationally unique undergraduate certificate program in Hydrogeology. The certificate, administered through the Department of Earth and Geographic Sciences, consists of a sequence of seven courses which, taken as a whole, provide the student with a comprehensive understanding of the field of hydrogeology, from theory to practice, with application to issues of water supply, water

quality, and water resource management. The proposed Certificate in Hydrogeology at CSU, Chico is designed to offer undergraduates, as well as professionals, comprehensive training in hydrology, hydrogeology, hydrogeochemistry and water resources management.

11. Identify the occupational areas of demand for students

Water and water resource demand in California will increase with projected statewide population growth. There is a steady employment demand for geology majors with hydrology and water resources backgrounds. The Department of Geological and Environmental Sciences regularly receives job announcements advertising for B.S. and M.S. level graduates. A recent example is:

"…. is looking for recent graduates in the geologic sciences… The work involves geological and hydrogeological investigations and monitoring for municipal and industrial wastewater treatment and disposal systems and water supply investigations. … The successful applicant will hold a degree in Geology or related field with knowledge of hydrogeologic principals…"

The proposed Certificate in Hydrogeology will equip students with the knowledge necessary to take advantage of existing and emerging career opportunities such as this.

12. Expected number of students seeking the certificate in the year of initiation and three years and five years thereafter.

We expect 10 students in the year of initiation, 15 students after three years, and 20 students after 5 years.

Expected number of certificates awarded in the year of initiation and three years and five years thereafter.

Depending on the commitment of the student, the proposed certificate may take at least two semesters to complete. We anticipate that the number of certificates awarded in any year will lag behind the enrollment in the program by at least a year.

Describe methodology for developing the estimates.

Estimates were developed based on inquiries for a Certificate in Hydrogeology from geology majors and the community at large.

13. Existing Support Resources

13a. Faculty members who would teach in the program:

David L. Brown, Associate Professor, Ph. D., Soil Science (Hydrology), 1995. 1988-90: Project Hydrologist, Pacific Environmental Group, San Jose, CA. 1995-97: Assistant Professor, Dept. of Forestry, University of Kentucky. 2000-Date: Science Director, Bidwell Institute for Applied Environmental Research, CSU, Chico.

Brown, D.L., 2005. Cherokee Watershed Water Quality Project: Final Report, Prepared for Butte County, CA. 84 pp.

Brown, D.L. and C.J. Martini, 2005. A Study of Soil Infiltration in Northern California Almond Orchards Using a Sprinkling Infiltrometer, Eos Trans. AGU, 85(46), Fall Meet. Supplement.

Brown, D.L., and Murphy, W.M. (2005) Transport of total and dissolved mercury from the Cherokee watershed, Sacramento River Basin, Northern California. Geological Society of America Abstracts with Programs, v. 37, No. 4, paper 46-5. (Geological Society of America Cordilleran Section, April 29 – May 1, 2005)

C J Coelho, D L Brown, M Johns, R Lopez, 2005. Laboratory, field, and modeling studies of organophosphate pesticide fate and transport during simulated rainfall-runoff events, Eos Trans. AGU, 85(46), Fall Meet. Supplement. Brown, D.L. and W.M. Murphy, 2005. Transport of Total and Dissolved Mercury from the Cherokee Watershed, Sacramento River Basin, Northern California, GSA Abstracts With Programs Vol. 37, No. 4, p. 104.

Karin A. Hoover, Assistant Professor, Ph. D., Hydrology, 1998. Research Scientist, Battelle Pacific Northwest National Laboratory, 1987-2000.

Hoover, Karin A. and M. Gordon Wolman. 2005. Beyond the semivariogram: patterns, scale, and hydrology in a semi-arid landscape. *Advances in Water Resources* 28: 885-898.

Gauthier, Amanda J. and Karin A. Hoover. 2005. Sediment delivery from chronic slope failures, Thomes Creek, California. *Eos Trans. Am. Geophys. Union* 86 (52), Abstract H51C-0382.

Hoover, K.A. and C.R. Benjamin. 2005. Butte Basin Recharge, Northern Sacramento Valley, CA. *Geological Society of America Abstracts With Programs* Vol. 37, No. 4.

Hoover, Karin A., Amanda J. Gauthier, and Eric P. Simmen. *Thomes Creek Sediment Budget*. Submitted to Tehama County Planning Department, June 2005.

William M. Murphy, Associate Professor, Ph. D., Geology, 1985. Exploration Geologist, Noranda Corporation, 1977-78; Senior Scientist, Rockwell and Westinghouse, 1986-1988; Staff Scientist, Southwest Research Institute, 1988-2000.

Murphy, W.M., and Chen, R. (2005) Water quality in springs, canals, and wells at Lijiang, Yunnan Province, China. Geological Society of America Abstracts with Programs, v. 37, No. 4, Paper 41-2. (Geological Society of America Cordilleran Section, April 29 – May 1, 2005)

Brown, D.L., and Murphy, W.M. (2005) Transport of total and dissolved mercury from the Cherokee watershed, Sacramento River Basin, Northern California. Geological Society of America Abstracts with Programs, v. 37, No. 4, paper 46-5. (Geological Society of America Cordilleran Section, April 29 – May 1, 2005)

Perkins, C.A., and Murphy, W.M. (2005) Spring, creek, and groundwater chemistry in the Big Chico Creek Ecological Reserve and the Butte Basin, California. Geological Society of America Abstracts with Programs, v. 37, paper 194-5. (Geological Society of America Annual Meeting, October 16 – 19, 2005)

Livingston, J.D., and Murphy, W.M., Miller, R.M., and Ayars, E.J. (2005) Acid mine drainage and metal sulfate minerals in the Shasta Mining District, California. EOS Trans. AGU, 86(52), Fall Meet. Suppl., Abstract V43B-1570. (American Geophysical Union Fall Meeting, December 5 – 8, 2005)

Verlaguet, A., Brunet, F., Goffé, B., and Murphy, W.M. (2006) Experimental study and modeling of fluid reaction paths in the quartz-kyanite±muscovite-water system at 0.7 GPa in the 350-550 °C range: implications for Al selective transfer during metamorphism. Geochimica et Cosmochimica Acta. In press.

Tal Nahir, Associate Professor, Ph.D., Chemistry, 1993. Over 10 years' research experience in environmental chemistry.

Greg Taylor, Professor, Ph.D., Geophysics, 1987. Over 20 years' research experience in geophysics, atmospheric science, and environmental modeling.

13b. Additional instructional resources (faculty, space, equipment, library volumes, etc.) needed to implement and sustain the proposed aggregate of courses. List all resources needed for the first five years beyond those currently projected, including specific resource, cost, and source of funding:

No additional faculty resources, space, equipment or library volumes are needed because all the courses in this certificate are already being taught in the department and all of the courses required for this certificate are already required or elective courses in other programs within the department.

14. Additional Support Resources Required (if applicable): Not applicable.

- Faculty or staff
- Facilities
- Library resources
- Equipment
- Specialized material

15. Attach a complete proposed catalog description, including admission and completion requirements. Follow exactly the catalog pattern. Before the proposal is submitted to the Vice Provost for Academic Affairs or Dean of the School of Graduate, International, and

Sponsored Programs, review with the Academic Operations and Publications Coordinator.

THE CERTIFICATE IN HYDROGEOLOGY

This certificate is to provide Geology majors with the information and skills necessary to become certified hydrogeologists in the State of California. Before beginning this certificate, students must have completed the following courses with a GPA of at least 2.5: CHEM 111, CHEM 112, GEOS 102, GEOS 306, PHYS 202A or PHYS 204A, PHYS 202B OR PHYS 204C, MATH 120.

Course Requirements for the Certificate: 26 units
The following courses, or their approved transfer equivalents, are required for all candidates for this certificate.

Lower-Division Requirements: 3 units
2 courses required:

GEOS 250 Computer Applications in Geoscience 1.0 FS

Prerequisites: Prior or concurrent enrollment in MATH 120, or consent of instructor.

GEOS 270 California Water 2.0 SP

Prerequisites: One course from Breadth Area B1 of General Education.

Upper-Division Requirements: 23 units
7 courses required:

GEOS 380 Hydrology 3.0 FA

Prerequisites: GEOS 270; PHYS 202A or PHYS 204A (may be taken concurrently).

GEOS 381 Hydrologic Field Methods 2.0 FA

Prerequisites: GEOS 270 (may be taken concurrently), GEOS 380, GEOS 415, prior hydrology coursework, or consent of instructor.

GEOS 390 Surficial Processes 3.0 FA

Prerequisites: MATH 120; either PHYS 202A or PHYS 204A.

GEOS 415 Hydrogeology 3.0 SP

Prerequisites: CHEM 111, GEOS 306, MATH 120; either PHYS 202A or PHYS 204A; either GEOS 270 or GEOS 380. Recommended: GEOS 307

GEOS 460 Water Resources Management 3.0 SP

Prerequisites: Upper-division standing; GEOS 330 or GEOS 380

GEOS 530 Environmental Systems Modeling I 3.0 EvnFA

Prerequisites: CHEM 112; GEOS 330 or faculty permission; MATH 120; either PHYS 202B or PHYS 204C

GEOS 545 Applied Geophysics 3.0 EvnSP

Prerequisites: One year of physics, GEOS 102, or faculty permission

1 course selected from:

GEOS 516 Natural Water Systems 3.0 EvnFA

Prerequisites: GEOS 415

GEOS 565 Geochemistry 3.0 FA

Prerequisites: CHEM 111, GEOS 102. Recommended: GEOS 306

16. Attach the Undergraduate Program Signature/Checklist/Routing form or the Graduate Program Signature/Checklist/Routing form to the proposal prior to submission. (The form should be printed from Web page. If you cannot print it, please call x6941 and a hard copy of the form will be sent to you.)