Graduate Program of Hydrologic Sciences

Handbook

Spring 2016

University of Nevada, Reno
Statewide • Worldwide

DRI
Desert Research Institute

PREFACE

Welcome to the Graduate Program Hydrologic Sciences (GPHS) Handbook. The handbook is a compilation of published University of Nevada information and GPHS program materials provided for the convenience of the students and faculty. It remains the student's responsibility to assure that the requirements set by the Advisory/Examining Committee and the Graduate School are met.

Note that all paperwork required by the Graduate School must be routed through the GPHS program office for the signature of the GPHS Director.

Most of the forms and documents provided in this handbook are also available online at the Graduate School website (http://www.unr.edu/grad/forms/) or at the GPHS website (http://www.hydro.unr.edu/). **The Graduate School will not accept any handwritten forms including applications.** All forms on the Graduate School website are interactive so that you can fill them in on-line and print them out for signatures.

Throughout your years in the GPHS your major advisor and committee will be your primary source of guidance.

Best wishes as you move forward toward your degree.

Laurel Saito
Program Director
Graduate Program of Hydrologic Sciences
hydro@unr.edu

PROGRAM FUNCTIONS

Program Calendar
All Program functions for the current semester will be displayed on our website. Please visit http://www.hydro.unr.edu/calendar.aspx to learn about upcoming events.

Colloquium Series
The Graduate Program of Hydrologic Sciences Program sponsors an excellent speaker series that routinely features nationally prominent scientists including the Henry Darcy Distinguished Lecturer and the Birdsall-Dreiss Distinguished Lecturer. Our Colloquium Series is developed and executed by the Student Speaker Committee. Student and faculty suggestions for speakers are solicited by the Student Speaker Committee several months in advance of each semester. Students should consider suggesting speakers who might be pertinent to their research topic. There are typically five or six speakers each semester. Each speaker will visit faculty and students throughout the day and lunch and breakfast visits are reserved for students only. Following each presentation we hold an informal social where the speaker interacts with our students and faculty in a relaxed environment. Of all Program functions, our Colloquium Series should take precedence. All students are expected to attend every Colloquium presentation. Please keep in mind the importance of good attendance at these functions because it is part of learning about a breadth of current hydrology topics, and it reflects directly on our Program. Routinely, outside speakers leave our campus being most impressed with the audience and degree of insightful questions. **Please make every effort to attend.**

Faculty/Student Meetings
The GPHS holds one or two meetings per semester. There is typically a meeting for all faculty and students at the beginning of each academic semester that all students are required to attend. A faculty meeting is held mid-semester to review the new student applicant pool, and this is usually the only meeting at which students are not allowed to attend.

Program Socials
The GPHS typically holds two socials per year to celebrate our new and graduating students. These are typically held near the beginning of the Fall semester to welcome new incoming students and around the end of the Spring semester to send off our graduating students. Please consult the Program web calendar for more details on the time and location. Family and friends of graduating students are welcome along with other current students, faculty, and alumni. These events are critically important to our program, so please plan to attend.

Conferences
Faculty and students regularly attend a variety of local, national and international conferences related to hydrology, including the American Geophysical Union (AGU) and Geological Society of America conferences. Travel funds are available for students from UNR's Graduate Student Association (GSA). Students who have applied for GSA funds may be eligible for additional funding through the GPHS pending availability of funds. Please contact the Program Director for more information.

GPHS Core (Voting) Faculty 2015-16

Last	First	Institution	Department	Email	Phone	Title
Adams	Kenneth	DRI	DEES	Ken.Adams@dri.edu	(775) 673-7345	Professor
Apambire	Braimah	DRI	DHS	braimah.apambire@dri.edu	(775) 673-7446	Professor
Arnone	Jay	DRI	DEES	Jay.Arnone@dri.edu	(775) 673-7445	Professor
Breitmeyer	Ronald	UNR	GEOL	rbreitmeyer@unr.edu	(775) 682-6049	Assistant Professor
Calvin	Wendy	UNR	GEOL	wcalvin@unr.edu	(775) 784-1785	Professor
Carroll	Rosemary	DRI	DHS	rosemary.carroll@dri.edu	(775) 673-7416	Assistant Professor
Chandra	Sudeep	UNR	NRES	sudeep@unr.edu	(775) 784-6221	Associate Professor
Cooper	Clay	DRI	DHS	clay.cooper@dri.edu	(775) 673-7372	Assistant Professor
Dennett	Keith	UNR	CEE	kdennett@unr.edu	(775) 784-4056	Associate Professor
Gustin	Mae	UNR	NRES	mgustin@cabnr.unr.edu	(775) 784-4203	Professor
Harpold	Adrian	UNR	NRES	aharpold@cabnr.unr.edu	(775) 784-6759	Assistant Professor
Hershey	Ronald	DRI	DHS	ron.hershey@dri.edu	(775) 673-7393	Associate Professor
Heyvaert	Alan	DRI	DHS	Alan.Heyvaert@dri.edu	(775) 673-7322	Assistant Professor
Huntington	Justin	DRI	DHS	justin.huntington@dri.edu	(775) 673-7670	Associate Professor
Louie	John	UNR	GEOL	louie@seismo.unr.edu	(775) 784-4219	Professor
Lutz	Alexandra	DRI	DHS	alex.lutz@dri.edu	(775) 673-7418	Assistant Professor
McCarthy	Maureen	UNR	PHYS	mimmcarthy@unr.edu	(775) 784-8262	Professor
McConnell	Joe	DRI	DHS	Joe.McConnell@dri.edu	(775) 673-7348	Professor
McCoy	Scott	UNR	GEOL	scottmccoy@unr.edu	(775) 682-7205	Assistant Professor
McGwire	Kenneth	DRI	DEES	ken.mcgwire@dri.edu	(775) 673-7324	Associate Professor
Miller	Glenn	UNR	NRES	gcmiller@unr.edu	(775) 784-4108	Professor
Noble	Paula	UNR	GEOL	noblepj@unr.edu	(775) 784-6211	Professor
Obrist	Daniel	DRI	ATMS	daniel.obrist@dri.edu	(775) 674-7008	Professor
Parashar	Rishi	DRI	DHS	rishi.parashar@dri.edu	(775) 673-7496	Assistant Professor
Pohll	Greg	DRI	DHS	Greg.Pohll@dri.edu	(775) 674-7523	Associate Professor
Poulson	Simon	UNR	GEOL	poulson@mines.unr.edu	(775) 784-1104	Associate Professor
Rajagopal	Seshadri	DRI	DHS	seshadri@dri.edu	(775) 673-7674	Assistant Professor
Rosen	Michael	USGS	GEOL	mrosen@usgs.gov	(775) 887-7683	Adjunct Professor
Saito	Laurel	UNR	NRES	lsaito@cabnr.unr.edu	(775) 784-1921	Associate Professor
Schmidt	Casey	DRI	DHS	cschmidt@dri.edu	(775) 673-7464	Assistant Professor
Schumer	Rina	DRI	DHS	Rina.Schumer@dri.edu	(775) 673-7414	Associate Professor
Singletary	Loretta	UNR	UNCE	singletaryl@unce.unr.edu	(775) 771-4452	Professor
Stillings	Lisa	USGS	GEOL	stilling@usgs.gov	(775) 784-5803	Adjunct Professor
Susfalk	Rick	DRI	DHS	Rick.Susfalk@dri.edu	(775) 673-7453	Associate Professor
Swanson	Sherm	UNR	NRES	sswanson@cabnr.unr.edu	(775) 784-4057	Associate Professor
Telyakovskiy	Aleksey	UNR	MATH	alekseyt@unr.edu	(775) 784-1364	Associate Professor
Thomas	Jim	DRI	DHS	Jim.Thomas@dri.edu	(775) 673-7305	Professor
Tyler	Scott	UNR	GEOL	styler@unr.edu	(775) 784-6250	Professor
Verburg	Paul	UNR	NRES	pverburg@cabnr.unr.edu	(775) 784-4511	Assistant Professor

GPHS Supporting Faculty 2015-16

Last	First	Institution	Department	Email	Phone	Title
Acharya	Kumud	DRI	DHS	Kumud.Acharya@dri.edu	(702) 862-5371	Associate Professor
Andraski	Brian	USGS	USGS	andraski@usgs.gov	(775) 877-7636	Adjunct Professor
Benedict	Chris	WASH CNTY	WASH CNTY	cbenedict@washoecounty.us	(775) 843-8568	Manager
Berli	Markus	DRI	DHS	Markus.Berli@dri.edu	(702) 862-5452	Associate Professor
Biondi	Franco	UNR	GEOG	fbiondi@unr.edu	(775) 784-6921	Professor
Bullard	Tom	DRI	DEES	tom.bullard@dri.edu	(775) 673-7420	Associate Professor
Chambers	Jeanne	USFS	NRES	chambers@unr.edu	(775) 784-5329	Adjunct Professor
Chen	Li	DRI	DHS	li.chen@dri.edu	(702) 862-5349	Assistant Professor
Dana	Gayle	DRI	DHS	gayle.dana@dri.edu	(775) 674-7538	Professor
Danko	George	UNR	MINE	danko@unr.edu	(775) 784-1833	Professor
Decker	David	DRI	DHS	dave.decker@dri.edu	(775) 673-7353	Associate Professor
Fritsen	Christian	DRI	DEES	chris.fritsen@dri.edu	(775) 673-7487	Professor
Grzymski	Joseph	DRI	DEES	joeg@dri.edu	775-673-7478	Professor
Hiibel	Sage	UNR	CEE	shiibel@unr.edu	(775) 327-2660	Assistant Research Professor
Jacobson	Roger	DRI	DHS	roger@dri.edu	(775) 673-7364	Professor
Jasoni	Richard	DRI	DEES	richard.jasoni@dri.edu	(775) 673-7472	Associate Professor
Kreamer	David	UNLV	GEOL	dave.kreamer@unlv.edu	(702) 895-3553	Professor
Lancaster	Nick	DRI	DEES	nick.lancaster@dri.edu	(775) 673-7304	Professor
Marion	Giles	DRI	DEES	giles.marion@dri.edu	(775) 673-7349	Associate Professor
Marchand	Eric	UNR	CEE	marchand@unr.edu	(775) 784-6817	Associate Professor
McDonald	Eric	DRI	DEES	Eric.McDonald@dri.edu	(775) 673-7302	Professor
Murray	Alison	DRI	DHS	alison.murray@dri.edu	(775)673-7361	Professor
Naranjo	Ramon	USGS	USGS	rnaranjo@usgs.gov	(775) 887-7659	Professor
Niswonger	Richard	USGS	USGS	rniswon@usgs.gov	(775) 887-7727	Adjunct Professor
Panorska	Anna	UNR	MATH	ania@unr.edu	(775) 784-1565	Professor
Pinsky	Mark	UNR	MATH	pinsky@unr.edu	(775-784-6725	Professor
Price	Jonathan	UNR	GEOL	jprice@unr.edu	(775) 784-6691	Adjunct Professor
Prudic	David	UNR	GEOL	dprudic@pyramid.net	(775) 315-7157	Adjunct Professor
Qualls	Jerry	UNR	NRES	qualls@unr.edu	(775) 327-5014	Associate Professor
Sada	Don	DRI	DHS	don.sada@dri.edu	(775) 673-7359	Associate Professor
Shevenell	Lisa	UNR	MINE	lisaas@unr.edu	(775) 784-1779	Professor
Snyder	Keirith	USDA	NRES	keirith.snyder@ars.usda.gov	(775) 784-6057	Adjunct Professor
Sullivan	Ben	UNR	NRES	bsullivan@cabnr.unr.edu	(775) 784-6374	Assistant Professor
Taylor	Ken	DRI	DHS	ken.taylor@dri.edu	(775) 673-7375	Professor
Tempel	Gina	UNR	GEOL	gtempel@unr.edu	(775) 784-4706	Associate Professor
Walker	Mark	UNCE	UNCE	walkerm@unce.unr.edu	(775) 784-1938	Associate Professor
Wells	Steve	DRI	DHS	steve.wells@dri.edu	(775) 673-7311	President
Weltz	Mark	USDA	NRES	Mark.Weltz@ars.usda.gov	(775) 784-6057	Adjunct Professor
Yang	Yu (Frank	UNR	CEE	yuy@unr.edu	(775) 682-6609	Assistant Professor
Zhu	Julian	DRI	DHS	jianting.zhu@dri.edu	(702) 862-5416	Associate Professor

Hydrologic Sciences Student Information Form

Name: _____

Student ID: _____

HS Program Status

Degree Name: Hydrology_____ Hydrogeology _____

Degree Plan: Master's Plan A _____ Master's Plan B_____ Ph.D. Degree _____

Advisor's Name: _____

Source of Funding: _____

Starting Date: _____ Anticipated Completion Date: _____

Work Address

Institution: _____

Department/Division: _____

Building/Room Number: _____

Mail Stop: _____

Telephone Number: _____

E-mail Address: _____

Home Address

Street/Apartment Number: _____

City, State, Zip Code: _____

Telephone Number: _____ Cell Phone Number: _____

Release of Information

The Graduate Program of Hydrologic Sciences wishes to protect the privacy of all students and will therefore only release home address information with the prior written consent of the student. Please sign next to the statement given below if you agree to release home address information to our faculty and students. Failure to sign will result in no release of home address information. Under no circumstances will we release any information to individuals outside of our program.

I agree to the release of my home address information. _____

Student Signature

Hydrologic Sciences Website

Do you wish to have an individual webpage on the GPHS website? ❒ Yes ❒ No

If yes, please email a photo and a short paragraph describing your research interests to hydro@unr.edu.

Research Interests (select up to five):

3-D Numerical Modeling
Agriculture/Irrigation
Aquatic Biology
Aquatic Ecology
Aquatic Ecosystem Modeling
Aquatic Restoration
Atmospheric Modeling
Atmospheric Pollution
Biogeochemical Cycles
Biogeochemistry
Carbon Dating
Carbon Sequestration
Climate Change
Computational Fluid Dynamics
Contaminant Transport
Dendrochrology
Dendroclimatology
Denitrification
Desalination
Ecology
Ecosystem Ecology
Education/Technical Training
Environmental Science
Evapotranspiration
Extreme Value Theory
Geochemistry
Geology
Geomorphology
Geophysics
Geothermal Energy
GIS/Spatial Analysis
Global Change
Groundwater/Surface Water Interactions
Heterogeneous Systems
Hydrogeology
Hydrology
Hyporheic Exchange
Ice Cores
Interdisciplinary Modeling
International Work
Isotope Geochemistry
Limnology
Modeling
Monitoring
Numerical Methods
Nutrient Cycling
Paleoecology
Paleohydrology
Plant Science
Remote Sensing
Riparian Hydrology
Risk Assessment
Scaling of Hydrologic Processes
Sediment Transport
Seismology
Soil Chemistry
Soil Science/Pedology
Statistical Analysis
Stochastic Processes
Stratigraphy
Surface Water Hydrology
Thermal Modeling
Vadose Zone Hydrology
Water Policy
Water Quality
Water Quality Modeling
Water Resource Economics
Water Resource Evaluation
Water Resources Engineering
Water Resources in Developing Countries
Watershed Processes
Wetland Hydrology

Hydrologic Sciences Initial Advisement Worksheet

Name_____

Student ID _____

Undergraduate Requirements (C- or better)

Physics:	Title of class	Year taken	Term	College
1st Sem.				
2nd Sem.				

Chemistry:	Title of class	Year taken	Term	College
1st Sem.				
2nd Sem.				

Calculus Through Differential Equations:

	Title of class	Year taken	Term	College
Calculus I				
Calculus II				
Diff. Equations				

Probability and Statistics:

Title of class	Year taken	Term	College

Possible courses that may be waived: (GPHS form must be signed for each course)

GPHS course	Title of class	Year taken	Term	College

Student Signature:_____Date:_____

Director Signature:_____Date:_____

Hydrologic Sciences (HS) Core Class Waiver Form

Student Name: _____

Student ID:_____

Core Class for which waiver is requested _____

Student should articulate rationale for waiving the course requirement and describe any proposed alternatives. Attach pertinent support documentation (e.g. catalog descriptions, syllabi, and transcripts of grades for prior coursework).

_____

_____

_____

_____

_____

Student's Advisor: _____

Advisor's Advice: ☐ Approve ☐ Disapprove _____

Advisor's Signature

The Advisor should describe briefly the rationale behind their advice.

_____

_____

_____

Core Class Instructor: _____

Recommendation: ☐ Approve ☐ Deny _____

Instructor's Signature

Instructor should describe briefly reasons behind recommending to deny the request.

_____

_____

Director's Decision: ☐ Approve ☐ Deny _____

Director's Signature

Director should describe briefly reasons behind denying the student's request.

_____

_____

Return Completed Form to:
Hydrologic Sciences Program Office

University of Nevada, Reno
Statewide • Worldwide

GRADUATE PROGRAM OF HYDROLOGIC SCIENCES
PH.D. QUALIFYING EXAM REPORT

Name: _____
Last First M.I.

Student ID: _____

Exam Evaluation:

Exam Date:_____

( ) Passed

( ) Further study required – see attached study plan

( ) Failed

_____ Date:_____
Chair, Oral Exam Committee

_____ Date:_____
Committee Member

_____ Date:_____
Committee Member

_____ Date:_____
Director, Graduate Program of Hydrologic Sciences
Dr. Laurel Saito

Return Completed Form to:
Hydrologic Sciences Program Office
UNR – GPHS
1664 N. Virginia St., Mail Stop 0175
Reno, NV 89557
hydro@unr.edu

University of Nevada, Reno
Statewide • Worldwide

GRADUATE PROGRAM OF HYDROLOGIC SCIENCES
EXIT INTERVIEW SURVEY

Name: _____
Last First M.I.

Graduation Date: _____
Semester Year

Advisor: _____
Last First M.I.

Future Address: _____
Street

_____
City State Zip

_____
Phone

_____
Email

Would you like to be included on our alumni email list? ❑ Yes ❑ No

Would you like to be included on our alumni web page? ❑ Yes ❑ No

Exit Interview Survey

1. How well did the Program teach you the theoretical basis and observational methods for study of water?
    a. Fully met expectations
    b. Substantially met expectations
    c. Failed to meet expectations

2. How well did the Program teach you the design and use of field instrumentation, computer models, data analysis and laboratory procedures for Hydrologic Sciences research and monitoring?
    a. Fully met expectations
    b. Substantially met expectations
    c. Failed to meet expectations

3. How well did the Program teach you the ability to explain ideas and results through written, numerical, graphical, spoken, and computer-based forms of communication?
    a. Fully met expectations
    b. Substantially met expectations
    c. Failed to meet expectations

4. How well do you think the program adapts to new avenues of scientific and engineering inquiry that offer interdisciplinary and practical applications to societal needs related to hydrology.
    a. Fully met expectations
    b. Substantially met expectations
    c. Failed to meet expectations

5. Were you able to find a job in hydrology or hydrogeology?
    a. Yes
    b. No

    If Yes, what is the name of your employer?

    _____

6. Please provide any additional comments regarding your educational experience.

Graduate Program of Hydrologic Sciences

Planning Guide

INTRODUCTION

Welcome to the Graduate Program of Hydrologic Sciences (GPHS), one of the nation's premier graduate programs in hydrologic sciences! A long standing strength of this program stems from a true collaboration between the University of Nevada, Reno (UNR) and the Desert Research Institute (DRI). This document has been prepared to assist you and your advisor in planning your coursework and study to best meet your needs. This Planning Guide gives you a complete summary of degree requirements. A list of related graduate courses and the estimated schedule of future class offerings is also available in the GPHS Handbook (http://www.hydro.unr.edu/degrees/handbook.aspx). Additional information about committee guidance and examination procedures can be found in the "PhD Comprehensive Exam Guidelines" and the "PhD Qualifying Exam Guidelines" and the UNR General Catalog.

MISSION STATEMENT

The GPHS is a multi-disciplinary program created to train graduate students in the diverse field of surface and subsurface aqueous environments. This diversity includes the study of aqueous geochemistry, contaminant transport (surface and subsurface), global climate change, groundwater hydraulics, plant/water interactions, remote sensing, soil physics, rock physics, water and environmental policy, surface water hydrology, aquatic ecology, paleohydrology, and water resources engineering. The curriculum is designed to guarantee a breadth of experience through a shared foundation core, while leaving ample time for concentration in either Hydrology or Hydrogeology.

ENTRANCE REQUIREMENTS and DEFICIENCIES

Students admitted to the Program should have a bachelor of sciences degree or equivalent in engineering, biology, chemistry, physics, geology, natural resources or ecology. Prospective graduate students should have GRE scores exceeding 153 verbal and 144 quantitative, an undergraduate GPA above 3.0, and international students should have TOEFL scores above 600.

In addition, the Program requires undergraduate prerequisites of 2 semesters each of calculus-based physics (PHYS 180 and 181, or equivalent), chemistry (CHEM 201 and 202, or equivalent) and calculus (MATH 181 and 182, or equivalent), one semester of probability/statistics (STAT 352, or equivalent), and differential equations (MATH 285, or equivalent). Although calculus-based physics is highly recommended, a non-calculus-based physics course, PHYS 151 and 152 or equivalent, will be allowed if approved by your advisor. Calculus III (Math 283) is not a formal requirement, but is highly recommended. Any deficiencies are to be made up during the first year of graduate study and students are encouraged to consult with their advisors and the GPHS Director for guidance on the appropriate courses for fulfilling deficiencies. Students must provide evidence that deficiencies were met if courses are not taken at UNR.

DEGREES OFFERED

The GPHS administers two separate UNR degrees (Hydrology and Hydrogeology) at both the M.S. and Ph.D. levels. There is a single, required, foundation core for all GPHS degrees that includes two credit hours of seminar along with one course each in groundwater, hydrologic fluid dynamics, hydrology, and environmental chemistry. Beyond this foundation core, each degree requires separate and additional coursework. The next sections summarize the selection of graduate courses that fulfill all requirements as well as a listing of other recommended courses for students in the GPHS. Students are expected to work with their advisor and committee members to develop a Plan of Study that best matches each student's research efforts and interests.

A non-thesis M.S. option is available in both Hydrology and Hydrogeology and is an appropriate alternative for those students with significant experience in project management and report writing, while maintaining the high standards of a Master of Science Degree. The non-thesis option is generally considered a terminal degree and is not recommended for students considering a future Doctoral degree. The Professional Paper (2 credits) should demonstrate the student's ability to integrate technical state-of-the-art knowledge into a document suitable for professional review and publication. Topics may be of an applied nature and must be approved by the student's Graduate Committee. A ready-to-submit manuscript must be approved by the major advisor prior to the final defense. Suitable outlets for publication include professional society proceedings, regional/national symposia and conferences, applied science and resource management journals, and other journals serving as a forum for scientific discussion.

The GPHS also administers a Graduate Certificate in International Water Resources and an accelerated BS/MS program in which undergraduate students in Civil Engineering, Environmental Engineering, or Ecohydrology can obtain the B.S. degree and an M.S. degree in Hydrology or Hydrogeology in a shorter time.

DEGREE REQUIREMENTS

This section describes the requirements for degree completion for the graduate degrees administered by the GPHS. For all degrees, Graduate School Academic requirements apply. All graduate students must maintain a cumulative graduate GPA of 3.0. If their GPA drops below 3.0 they are either placed on probation or dismissed. Undergraduate courses do not count towards graduate GPA.

Probation: Students whose cumulative graduate GPA is 0.1 to 0.6 points below that needed for a 3.0 GPA are put on probation. Students are placed on academic probation for one semester. If they fail to raise their cumulative GPA to 3.0 by the end of one semester, they are dismissed from their graduate program. Thesis, dissertation, S/U graded credits, and transfer credits have no impact on a student's GPA.

Dismissal: students whose cumulative graduate GPA is .7 or more grade points below that needed for a 3.0 GPA are dismissed. Dismissed students are no longer in a graduate program but may take graduate-level courses as a Grad Special. Students wishing to complete their degree must obtain approval to take graduate-level courses, raise their graduate GPA to at least 3.0 and then re-apply to a graduate program. Any courses taken

to raise their GPA will be included in the graduate special/ transfer credit limitation (9 credits for master's degrees).

Continuous Enrollment: To maintain "good standing" all graduate students are required to enroll in a minimum of three (3) graduate credits each fall and spring semester until they graduate. International students may be required to enroll in nine graduate credits each fall and spring semester depending on the requirements of their visa. All students holding assistantships (whether teaching or research assistantships) are required to enroll in a minimum of six (6) graduate credits each semester they hold the assistantship.

Leave of Absence: Students in good standing may request a leave of absence by completing a leave of absence form available on the Graduate School website during which time they are not required to maintain continuous registration. Usually, a leave of absence is approved for one or two semesters. The leave of absence request may be extended by the student filing an additional leave of absence form. Students applying for a leave of absence should not have any "incomplete" grades which could be changed to "F" and have a detrimental impact on their cumulative GPA. Requests for leave of absences must be received by the Graduate School no later than the last day of enrollment for the semester the leave is to begin.

Reinstatement: When a student has been absent for one semester or more without an approved leave of absence, he or she may request reinstatement via the Reinstatement form available on the Graduate School website. This form allows the program the option to recommend the student be re-admitted to their graduate program based on their previous admission OR require the student to re-apply for admission which would require students to submit a new application for admission and pay the application fee. The Notice of Reinstatement to Gradate Standing must be received by the Graduate School no later than the last day of enrollment for the semester the reinstatement is to begin.

Transfer Credits: These are credits transferred from another institution. Credits completed at UNR in another program or as a graduate special do not need to be transferred. Transfer credit is requested on the Graduate Credit Transfer Evaluation Request form available on Graduate School website and must be signed by the student, major advisor, and graduate director. Transfer credits applied to a master's program must comply with the time limitation on master's work (6 years). Thus, if a student took a course five years prior to admission, they would have to complete the degree within one year for the course to apply to the degree. Credits from a completed master's degree will be exempt from the 8-year time limitation for those students earning a doctoral degree.

SHARED HYDROLOGY AND HYDROGEOLOGY CORE REQUIREMENTS*

A grade of "B-" or better is required for each of these classes which can only be retaken once.

NRES/GEOL 614	HYDROLOGIC FLUID DYNAMICS (3)
GE 684	GROUND WATER HYDROLOGY (3)
GEOL 616	ENVIRONMENTAL GEOCHEMISTRY (3)
NRES 682	SMALL WATERSHED HYDROLOGY (4)
GEOL/NRES 782	HYDROLOGY/HYDROGEOLOGY SEMINAR (2)

Note: Students who have previously taken one or more of the shared core courses may request to waive these requirements. Consult with your advisor and the GPHS Director for more information and requirements.

All students are required to complete GEOL/NRES 782 twice for a total of 2 credits. Students in their first year in the GPHS should enroll in GEOL/NRES 782 for 1 credit, which involves gaining an overview of the program through observation and evaluation of student presentations and the GPHS colloquium as well as learning presentation skills. Students in their second year in the GPHS should enroll in GEOL/NRES 782 for 1 credit, which involves getting experience in giving oral and poster presentations, and experience in conference organization.

Master of Science in Hydrology (31 credits Plan A, 32 credits Plan B)

Student education and research examine the broad area of surface water hydrology, including but not limited to: hydraulics, water quality, limnology, watershed hydrology and rehabilitation and geomorphology. Students follow the shared core of five (5) courses that provide the fundamentals of hydrologic fluid mechanics and introductions to surface and ground water hydrology and environmental chemistry as well as two credits of seminar in Hydrologic Sciences. Student learning outcomes (SLOs) for the degree are that students will be able to:

1. Demonstrate a basic level of competency in the general field of hydrology
2. Explain ideas and results through written, numerical, graphical, spoken, and computer-based forms of communication
3. Complete research in their field of study, including answering specific question(s) in conjunction with the advisor and thesis committee
4. Demonstrate appropriate quantitative skills for their sub-discipline

Students can pursue a Master of Science degree either with Plan A (thesis) or Plan B (non-thesis option). Because of the diverse nature of the skill sets needed by students, additional credits beyond the University minimums are required. The Masters of Science Plan A degree in Hydrology requires a minimum of 31 credits beyond the Bachelor degree, of which at least 18 credits (including 6 credits of thesis) must be at the 700-level.

Students must sign up for thesis credits in the department of their advisor. For the non-thesis option (Plan B), a minimum of 32 credits is required with at least 15 credits at the 700-level (including 2 credits of Professional Paper). Students should consult with their advisor and the GPHS Director for guidance on choice of plan options. In general however, the Plan B option should be considered as a terminal degree. All work towards a master's degree must be completed within six (6) years immediately preceding the granting of the degree. For more information on credit requirements, students should consult the UNR General Catalog.

The Master of Science in Hydrology degree allows flexibility to allow students to follow one or more of the broad areas of surface water hydrology and to allow for specialization. All students receive a broad underpinning of the hydrologic sciences through the shared core courses. Additional requirements for the degree include one or more specialization courses in surface water hydrology.

ADDITIONAL HYDROLOGY REQUIREMENTS

Students following the Hydrology degree track (either MS or Ph.D.) are required to complete at least one course from the list provided below.

CEE 604	OPEN CHANNEL FLOW (3)
CEE 618	PRINCIPLES OF WATER QUALITY MODELING (3)
CEE 653	ENVIRONMENTAL MICROBIOLOGY (3)
CEE 658	ENVIRONMENTAL CHEMISTRY CONCEPTS AND DESIGN (3)
CEE 756	ENVIRONMENTAL CHEMICAL KINETICS (3)
GE 617	QUANTITATIVE WATER QUALITY ANALYSIS (3)
GEOL 701J	SEDIMENT TRANSPORT (3)
GEOL 701J	FLUVIAL GEOMORPHOLOGY (3)
GEOL 701S	FIELD METHODS (3)
GEOL 780	ISOTOPE HYDROLOGY (3)
GEOL 781	ADVANCED SURFACE WATER HYDROLOGY (3)
NRES 684	LIMNOLOGY (3)
NRES 730	INTERDISCIPLINARY MODELING (3)
NRES 765	BIOGEOCHEMICAL CYCLES (3)

Doctor of Philosophy Degree in Hydrology (72 Credits)

Candidates for the Ph.D. degree in Hydrology must satisfy all general requirements of the Graduate School and the M.S. degree in Hydrology. SLOs for the degree are that students will be able to:

1. Demonstrate a basic level of competency in the general field of hydrology and in their area of research
2. Explain ideas and results through written, numerical, graphical, spoken, and computer-based forms of communication
3. Complete research in their field of study, including answering specific question(s) in conjunction with the advisor and dissertation committee

4. Demonstrate appropriate quantitative skills for their sub-discipline

The Doctoral degree in Hydrology requires 72 credits beyond the Bachelor degree, successful completion of a qualifying examination after the first year of study, and 1 credit of Comprehensive Examination. The Comprehensive Examination credit may count toward the required 30 credits of 700-level coursework. 24 credits of dissertation credits must be applied to the Doctoral degree, and students must sign up for these credits in the department of their advisor. A maximum of 24 credits of course work (with grades of "B" or better) from a completed master's degree program may be allocated toward the doctoral degree upon completion and approval of a Credit Transfer Evaluation Request Form. Up to 18 credits of 700-level courses may be transferred from the master's degree program. All work towards a doctoral degree must be completed within eight (8) years immediately preceding the granting of the degree. Credits transferred into doctoral degree from a completed master's degree are exempt from this eight-year limit.

Note that the GPHS does not generally accept students with only Bachelor degrees directly into the Doctoral degree programs; rather, these students are first accepted into the Master's Program and may be considered for the Doctoral degree after one year of study. Students interested in proceeding directly to the Doctoral degree should contact the GPHS Director for further guidance.

The Doctorate of Philosophy in Hydrology allows flexibility to allow students to follow one or more of the broad areas of surface water hydrology and to allow for specialization. All students receive a broad underpinning of the hydrologic sciences through the shared core courses. Additional requirements for the degree include a course in watershed hydrology to provide an overview/introduction of surface water processes and one or more specialization courses in surface water hydrology.

Consult with your advisor and the GPHS Director for more information and requirements. Doctoral degree candidates should consult the "GPHS Examination Procedure Guidelines" information package for a review of committee, qualifying and comprehensive examination procedures and scheduling.

Master of Science in Hydrogeology (31 credits Plan A, 32 credits Plan B)

Student education and research examine the occurrence and processes associated with subsurface water transport. Specific areas of emphasis include but are not limited to: ground water contaminant transport, geochemical evolution of ground waters, nutrient transport processes in soils and ground water, vadose zone hydrology and numerical simulation of ground water, geochemistry and reactive transport. Students follow the shared core of five (5) courses that provide the fundamentals of fluid mechanics and introductions to surface and ground water hydrology and environmental chemistry as well as two credits of seminar in Hydrologic Sciences. SLOs for the degree are that students will be able to:

1. Demonstrate a basic level of competency in the general field of hydrogeology
2. Explain ideas and results through written, numerical, graphical, spoken, and computer-based forms of communication

3. Complete research in their field of study, including answering specific question(s) in conjunction with the advisor and thesis committee
4. Demonstrate appropriate quantitative skills for their sub-discipline

Students can pursue a Master of Science degree either with Plan A (thesis) or Plan B (non-thesis option). The Master of Science Plan A degree in Hydrogeology requires a minimum of 30 credits beyond the Bachelor degree, of which at least 18 credits (including 6 credits of thesis) must be at the 700-level. Students must sign up for thesis credits in the department of their advisor. For the non-thesis option (Plan B), a minimum of 32 credits is required with at least 15 credits at the 700-level (including 2 credits of Professional Paper). Students should consult with their advisor and the GPHS Director for guidance on choice of plan options. In general however, the Plan B option should be considered as a terminal degree. All work towards a master's degree must be completed within six (6) years immediately preceding the granting of the degree. For more information on credit requirements, students should consult the UNR General Catalog.

The Master of Science in Hydrogeology degree allows flexibility to allow students to follow one or more of the broad areas of subsurface hydrology and to allow for specialization. All students receive a broad underpinning of the hydrologic sciences through the shared core courses. Students are expected to work with their advisors and committee members to develop a Plan of Study that best matches their research efforts and interests.

ADDITIONAL HYDROGEOLOGY REQUIREMENTS

Students following the Hydrogeology degree track (either MS or Ph.D.) are required to complete at least one of the following courses:

CEE 653	ENVIRONMENTAL MICROBIOLOGY (3)
CEE 658	ENVIRONMENTAL CHEMISTRY CONCEPTS AND DESIGN (3)
CEE 756	ENVIRONMENTAL CHEMICAL KINETICS (3)
GE 685	WASTE CONTAINMENT (4)
GEOL 701J	SEDIMENT TRANSPORT (3)
GEOL 701S	FIELD METHODS (3)
GEOL 716	LOW TEMPERATURE AQUEOUS GEOCHEMISTRY (3)
GEOL 780	ISOTOPE HYDROLOGY (3)
GEOL 783	GROUNDWATER HYDRAULICS (3)
GEOL/NRES 784	VADOSE ZONE HYDROLOGY (3)
GEOL 785	INTRODUCTION TO GROUNDWATER MODELING (3)
GEOL 786	CONTAMINANT TRANSPORT IN GROUNDWATER FLOW SYSTEMS (3)
NRES 702	SOIL BIOGEOCHEMISTRY (3)
NRES 730	INTERDISCIPLINARY MODELING (3)

Doctor of Philosophy Degree in Hydrogeology

Candidates for the Ph.D. degree in Hydrogeology must satisfy all general requirements of the Graduate School and the M.S. degree in Hydrogeology. SLOs for the degree are that students will be able to:

1. Demonstrate a basic level of competency in the general field of hydrogeology and in their area of research
2. Explain ideas and results through written, numerical, graphical, spoken, and computer-based forms of communication
3. Complete research in their field of study, including answering specific question(s) in conjunction with the advisor and dissertation committee
4. Demonstrate appropriate quantitative skills for their sub-discipline

The Doctoral degree in Hydrogeology requires 72 credits beyond the Bachelor degree, successful completion of a qualifying examination after the first year of study and 1 credit of Comprehensive Examination. The Comprehensive Examination credit may count toward the required 30 credits of 700-level coursework. 24 credits of dissertation credits must be applied to the Doctoral degree, and students must sign up for these credits in the department of their advisor. A maximum of 24 credits of course work (with grades of "B" or better) from a completed master's degree program may be allocated toward the doctoral degree upon completion and approval of a Credit Transfer Evaluation Request Form. Up to 18 credits of 700-level courses may be transferred from the master's degree program. All work towards a doctoral degree must be completed within eight (8) years immediately preceding the granting of the degree. Credits transferred into doctoral degree from a completed master's degree are exempt from this eight-year limit.

Note that the GPHS does not generally accept students with only Bachelor degrees directly into the Doctoral degree programs; rather, these students are first accepted into the Master's Program and may be considered for the Doctoral degree after one year of study. Students interested in proceeding directly to the Doctoral degree should contact the GPHS Director for further guidance.

The Doctorate of Philosophy in Hydrogeology allows flexibility to allow students to follow one or more of the broad areas of subsurface hydrology and to allow for specialization. All students receive a broad underpinning of the hydrologic sciences through the shared core courses. Additional requirements for the degree include two or more specialization courses in hydrogeology. Students are expected to work with their advisors and committee members to develop a Plan of Study that best matches their research efforts and interests.

Consult with your advisor and the GPHS Director for more information and requirements. Doctoral degree candidates should consult the "GPHS Examination Procedure Guidelines" information package for a review of committee, qualifying and comprehensive examination procedures and scheduling.

M.S. DEGREE IN HYDROLOGY AND HYDROGEOLOGY CHECKLIST

- ❒ Upon arriving at the University schedule an appointment with the Program Director for an entrance interview. At this meeting you will be asked to complete a **Student Information Form** and an **Initial Advisement Worksheet**.
- ❒ Attend the New Graduate Student Orientation that assists graduate students in familiarizing themselves with the university and its support services. It is a required program for all new graduate students. Orientation sessions are held on campus just before classes begin each semester. For those graduate students who are unable to attend on campus orientation, contact the Graduate School to complete mandatory online sexual harassment training. The New Graduate Student Orientation fee is charged to your first semester fees. It is a mandatory non-refundable charge.
- ❒ During the first year of study you should develop a research proposal in concert with your advisor.
- ❒ Submit the **Declaration of Advisor** form (http://www.unr.edu/grad/forms/declaration-of-advisor) to the Program Director no later than the end of the second semester of your program.
- ❒ In consultation with your advisor establish an academic committee. The GPHS would like to see this formed within the first year of study but this must be done no later than the end of the 3rd semester to comply with Graduate School requirements. The committee must contain at least three members, including your advisor, and at least one committee member who is from outside of your home department. For example, if your advisor resides at DRI, one member cannot be affiliated with the UNR department with which your advisor is affiliated. If your advisor is UNR faculty, one member cannot be affiliated with the home department of your advisor. This "outside" member can be a GPHS faculty member or a faculty member from any other department within UNR. Students can include someone who is not affiliated with the GPHS or UNR on their committee if the student provides a written request to the Program Director stating why this person should be on the committee (e.g., how their expertise is essential to the research). The Program Director will then write a memo to the Graduate School to enable this person to serve on the graduate committee. If approved, this person will be affiliated with the UNR department to which the advisor is affiliated, so this person cannot serve as the outside committee member. Formal approval of all student advisory committees is made by the Graduate Dean.
- ❒ Prior to the first committee meeting, complete the **Program of Study Document** (see http://www.unr.edu/grad/forms). Bring this document to the Program Director for review. Please review the Graduate Program of Hydrologic Sciences Planning Guide and the Graduate School Catalog to ensure that your coursework fulfills both the Program and Graduate School requirements. Note that the "outside" committee

member signs as the graduate school representative, and the Graduate School will not accept hand-written Programs of Study.

- ❒ Once the research proposal is approved by your advisor, distribute it to your committee two weeks prior to the first committee meeting. It is the student's responsibility to schedule the committee meeting.
- ❒ Make an oral presentation of your research proposal to the academic committee and gain committee approval to proceed. Your committee should review, approve and sign your **Program of Study Document**. If all committee signatures are in place, the Program Director will sign the document and deliver it to the Graduate School. **Note that the **Program of Study Document** must be filed with the Graduate School at least one full semester prior to graduation. The deadline for submitting the **Program of Study Document** for AUGUST and DECEMBER graduation is typically during the third week of APRIL, and the deadline for MAY graduation is typically during the third week of NOVEMBER of the prior year.
- ❒ Complete your Application for Graduation document and obtain your advisor's signature. Deliver the application to the Program Director for his/her signature and delivery to the Graduate School. The application is available online at: http://www.unr.edu/grad/forms. Graduation application deadlines are: MARCH 1 for MAY Graduation, JUNE 1 for AUGUST Graduation, and OCTOBER 1 for DECEMBER Graduation.
- ❒ Prepare a draft of your thesis or professional paper and obtain advisor approval. Distribute the approved and complete document to your committee at least two weeks prior to the defense date. It is the responsibility of the student to schedule the defense date and location. Send the Program Director (hydro@unr.edu) an announcement of the defense with the date, time, location, and thesis title at least one week prior to the defense date**. If the defense is not announced at least one week prior to the defense date, the Program Director will not sign your Notification of Completion Document and you will have to reschedule.**
- ❒ Make an oral presentation (Defense) of your thesis or professional paper to the academic committee and gain committee approval to graduate.
- ❒ Make final corrections to your thesis or professional paper and then complete your **Notification of Completion Document** (see http://www.unr.edu/grad/forms) and obtain committee signatures. Obtain the Program Director's signature, and then deliver to the Graduate School. Follow the instructions on the **Thesis/Dissertation guidelines and submission requirements** (see http://www.unr.edu/grad/forms/thesis-filing-guidelines) to file your thesis. The signed copy of your **Notice of Completion** must be submitted to the Graduate School approximately two weeks before the official end of the semester (see http://www.unr.edu/grad/graduation-and-deadlines for the actual dates). Your advisor will also have to sign the **Final Review Approval** form (see http://www.unr.edu/Documents/graduate-school/thesis-final-review-appoval-form.pdf) that goes with your final thesis submittal.
- ❒ Congratulations.

PH.D. DEGREE IN HYDROLOGY AND HYDROGEOLOGY CHECKLIST

- ❒ Upon arriving at the University schedule an appointment with the Program Director for an entrance interview. At this meeting you will be asked to complete a **Student Information Form** and an **Initial Advisement Worksheet**.
- ❒ Attend the New Graduate Student Orientation that assists graduate students in familiarizing themselves with the university and its support services. It is a required program for all new graduate students. Orientation sessions are held on campus just before classes begin each semester. For those graduate students who are unable to attend on campus orientation, contact the Graduate School to complete mandatory online sexual harassment training. The New Graduate Student Orientation fee is charged to your first semester fees. It is a mandatory non-refundable charge.
- ❒ During the first year of study the student should schedule the qualifying exam which consists of:
    - o Oral Proficiency Examination
    - o Approval of Program of Study
    - o Development, presentation and defense of detailed doctoral research proposal
- ❒ The student should notify the Program Director to schedule the Oral Proficiency Examination. The Director will choose the examination committee and its chair who will schedule and administer the exam. Upon successful completion of the Oral Proficiency Exam, the examination committee will sign the GPHS Ph.D. Oral Proficiency Exam Report and submit it to the Program Director.
- ❒ During the first year of study you should develop a research proposal in concert with your advisor.
- ❒ Submit the **Declaration of Advisor** form (http://www.unr.edu/grad/forms/declaration-of-advisor) to the Program Director no later than the end of the third semester of your program.
- ❒ In consultation with your advisor establish an academic committee. The GPHS would like to see this formed within the first year of study but this must be done no later than the end of the 4th semester to comply with Graduate School requirements. The committee must contain at least five members, including your advisor, and at least one committee member needs to be from the same department as your advisor. In addition, at least one committee member must be from outside of your home department. For example, if your advisor resides at DRI, one member cannot be affiliated with the UNR department with which your advisor is affiliated. If your advisor is UNR faculty, one member cannot be affiliated with the home department of your advisor. This “outside” member can be a GPHS faculty member or a faculty member from any other department within UNR. Students can include someone who is not affiliated with the GPHS or UNR if the student provides a written request to the

Program Director stating why this person should be on the committee (e.g., how their expertise is essential to the research). The Program Director will then write a memo to the Graduate School to enable this person to serve on the graduate committee. If approved, this person will be affiliated with the UNR department to which the advisor is affiliated, so this person cannot serve as the outside committee member. Formal approval of all student advisory committees is made by the Graduate Dean.

- ❒ Prior to the first committee meeting, complete the **Program of Study Document** (see http://www.unr.edu/grad/forms). Bring this document to the Program Director for review. Please review the Graduate Program of Hydrologic Sciences Planning Guide and the Graduate School Catalog to ensure that your coursework fulfills both the Program and Graduate School requirements. Note that the "outside" committee member signs as the graduate school representative, and the Graduate School will not accept hand-written Programs of Study.
- ❒ Once the research proposal is approved by your advisor, distribute it to your committee two weeks prior to the first committee meeting. It is the student's responsibility to schedule the committee meeting.
- ❒ Make an oral presentation of your research proposal to the academic committee and gain committee approval to proceed. Your committee should review, approve and sign your **Program of Study Document**. If all committee signatures are in place, the Program Director will sign the document and deliver it to the Graduate School. **Note that the **Program of Study Document** must be filed with the Graduate School at least one full semester prior to graduation. The deadline for submitting the **Program of Study Document** for AUGUST and DECEMBER graduation is typically during the third week of APRIL, and the deadline for MAY graduation is typically during the third week of NOVEMBER of the prior year.
- ❒ After approximately 75 percent of your coursework is complete, schedule and take your Comprehensive Examination. The student's advisor is responsible for administering the exam. You must sign up for 1 credit of Comprehensive Examination in the department of your advisor during the semester you intend to complete the Comprehensive Examination. Upon successful completion of the Comprehensive Examination, complete the **Doctoral Degree Admissions to Candidacy** form (see http://www.unr.edu/grad/forms), and get the signatures of your committee members. If all committee signatures are in place, the Program Director will sign the document and deliver it to the Graduate School.
- ❒ Complete your Application for Graduation document and obtain your advisor's signature. Deliver the application to the Program Director for his/her signature and delivery to the Graduate School. The application is available online at: http://www.unr.edu/grad/forms. Graduation application deadlines are: MARCH 1 for MAY Graduation, JUNE 1 for AUGUST Graduation, and OCTOBER 1 for DECEMBER Graduation.
- ❒ Prepare a draft of your dissertation and obtain advisor approval. Distribute the approved and complete document to your committee at least two weeks prior to the defense date. It is the responsibility of the student to schedule the defense date and location. Send the Program Director (hydro@unr.edu) an announcement of the

defense with the date, time, location, and thesis title at least one week prior to the defense date**. If the defense is not announced at least one week prior to the defense date, the Program Director will not sign your Notification of Completion Document and you will have to reschedule.**

- ❒ Make an oral presentation (Defense) of your dissertation to the academic committee and gain committee approval to graduate.
- ❒ Make final corrections to your dissertation and then complete your **Notification of Completion Document** (see http://www.unr.edu/grad/forms) and obtain committee signatures. Obtain the Program Director's signature, and then deliver to the Graduate School. Follow the instructions on the **Thesis/Dissertation guidelines and submission requirements** (see http://www.unr.edu/grad/forms/dissertation-filing-guidelines) to file your dissertation. The signed copy of your **Notice of Completion** must be submitted to the Graduate School approximately two weeks before the official end of the semester (earlier if you intend to be hooded at graduation; see http://www.unr.edu/grad/graduation-and-deadlines for the actual dates). Your advisor will also have to sign the **Final Review Approval** form (see http://www.unr.edu/Documents/graduate-school/dissertation-final-review-approval-form.pdf) that goes with your final dissertation submittal.
- ❒ Congratulations.

Graduate Program of Hydrologic Sciences

Proposal Guidelines

INTRODUCTION

This was created to help our graduate students write a successful thesis/dissertation proposal. Once completed and approved by the student's advisor, the research proposal is presented by the student to the student's advisory/examining committee.

This document is meant to serve as a guide for students. Individual proposals may vary depending on the requirements set forth by the student's advisor and thesis/dissertation committee. The overall goal of the proposal is to present research methodology in a direct and clear manner.

All proposals should address the following issues in one form or another.

1. What is the problem being addressed?
2. What is the hypothesis being tested?
3. Why is the problem important and interesting?
4. What will you DO to address the problem? If you complete the plan, will that bring us closer to an answer to the problem?
5. Why is the research significant and important?
6. (Ph.D. Students) What is the new or original research that you are contributing to the field
7. Is the topic is feasible in terms of availability of funding, equipment, supervisors, data, and can the research be completed?

M.S. VERSUS PH.D. PROPOSALS

Your advisor is the best person to provide a detailed clarification of your research expectations. The main differences between a M.S. and Ph.D. proposal and associated research are likely to be in the length and complexity of the research (not necessarily the proposal), and that the Ph.D. research must contain something new to the field of hydrology.

SUGGESTED PROPOSAL FORMAT

1. Cover page (1 page) – Name, email, degree for which you are a candidate, advisor, and committee's name, title, and date.
2. Project Summary or Abstract (1 page) - This is a self-contained, third-person description of objectives, methods, significance. Usually one will write this after the entire proposal is completed.
3. Project Description
    a. Objectives and Expected Significance
        - What are the main scientific challenges? Emphasize what the new ideas are. Briefly describe the project's major goals and their impact on the state of the art.

- Clearly state the question you will address: Why is it important? What makes something important varies with the field. For some fields, the intellectual challenge should be emphasized, for others the practical applications should be emphasized. Why is it an interesting/difficult/challenging question? It must be neither trivial nor impossible.

b. Background and Technical Need
   - What long-term technical goals will this work serve?
   - What are the main barriers to progress? What has led to success so far and what limitations remain? What is the missing knowledge?
   - What aspects of the current state-of-the-art lead to this proposal? Why are these the right issues to be addressing now?
   - What lessons from past and current research motivate your work. What value will your research provide? What is it that your results will make possible?
   - What is the relation to the present state of knowledge, to current work here & elsewhere? Cite those whose work you're building on (and whom you would like to have review your proposal). Don't insult anyone. For example, don't say their work is "inadequate;" rather, identify the issues they didn't address.
   - Cite relevant literature
   - You can build your credentials in this section by summarizing other people's work clearly and concisely and by stating how your work uses their ideas and how it differs from theirs.

c. Research Description
   - Broad technical description of research plan: activities, methods, data, and theory.
   - This the part that counts. WHAT will you do? Why is your strategy an appropriate one to pursue? What is the key idea that makes it possible for to answer this question? HOW will you achieve your goals? Concisely and coherently, this section should complete the arguments developed earlier and present your initial pass on how to solve the problems posed. Avoid repetitions and digressions.
   - Present a plan for how you will go about addressing/attacking/solving the questions you have raised.
   - Discuss expected results and your plan for evaluating the results. How will you measure progress?
   - Include a discussion of milestones and expected dates of completion. You are not committed to following this plan - but you must present a FEASIBLE plan to convince your committee that you know how to go about getting research results.

4. Program of Study: Include a list of all courses taken (including the number of credits and when they were taken) and all courses you are planning to take (including the number of credits and when you are planning to take them) that you will use to meet the requirements of your degree. **Do not include undergraduate courses.** *It is highly recommended that you have the Program Director review a DRAFT of the Program of Study before your proposal meeting.*

HYDROLOGIC SCIENCES ORAL QUALIFYING EXAMINATION GUIDELINES AND STUDY INFORMATION FEB 2016

INTRODUCTION

Each doctoral candidate is required to pass 3 steps of the Qualifying Examination at the end of their first year of study. The purpose of this Qualifying Examination is to insure that the student is well prepared and well qualified to begin their doctoral research. The three steps of the qualifying examination are:

- *Component 1: Oral Proficiency Examination*
- *Component 2: Approval of Program of Study*
- *Component 3: Development, presentation, and defense of a detailed doctoral research proposal.*

ORAL PROFICIENCY EXAMINATION DETAILED INFORMATION

The Oral Proficiency Examining Committee administers the examination. The Committee consists of the student's advisor and two members, chosen by the GPHS Director. At least one member should represent a faculty member who teaches one of the Shared Foundation Core Courses.

The examining committee will provide to the student at least two weeks prior to date of the examination a list of example questions and general study areas. The student may choose to select one question from the example list and prepares a 10-15 minute oral response as their first question in the examination. The examining committee will then proceed to oral questioning to assess the student's knowledge and comprehension of the fundamentals of hydrology, focusing in major part on the subject areas found in the Hydrologic Sciences Shared Foundation Core Courses. Typically, the exam will be two hours in length.

The examining committee will provide to the Program Director its written appraisal (see attached form) of the student's qualifications to proceed with his/her doctoral candidacy. If the student receives a passing grade on the exam he/she will be allowed to continue doctoral candidacy. If the student receives a failing grade, the Program Director will inform the student in writing of his/her dismissal from the Graduate Program of Hydrologic Sciences.

EXAMPLE QUESTIONS

Candidate MAY choose one question FROM ANY OF THE GENERAL STUDY AREAS for formal response at the oral examination and expect oral questions in all four areas below:

General Study Area: Groundwater

1. What is the main difference between saturated porous media flow and unsaturated media flow? How does the state of fluid saturation affect Darcy's Law?

2. Describe the difference between a confined aquifer and an unconfined aquifer. What differences, if any, will occur during pumping of these two aquifers?

3. What is the Dupuit assumption in ground water flow?

4. Discuss the concept of effective stress and how it affects storage in a confined aquifer.

5. For Darcy's Law: $q = \frac{k\rho g}{\mu}\frac{dh}{dx}$, explain each of the terms, including typical units. For the terms on the right hand side, explain whether they contribute to a driving force or a resisting force.

6. Head measurements in several nearby wells indicate that the direction of **J** (the negative of the gradient) is 20° north of east. A tracer test in the same aquifer has shown that the groundwater flow direction is 30° north of east.

    a. Is the aquifer isotropic or anisotropic?
    b. If the aquifer is anisotropic, which is larger, K_x or K?

7. For each of the following equations, tell whether the aquifer it describes is:
    isotropic/anisotropic
    homogeneous/heterogeneous
    transient/steady state

    a. $\frac{\partial}{\partial x}\left(K\frac{\partial h}{\partial x}\right) + \frac{\partial}{\partial y}\left(K\frac{\partial h}{\partial y}\right) = S_s\frac{\partial h}{\partial t}$

    b. $K_x\frac{\partial^2 h}{\partial x^2} + K_y\frac{\partial^2 h}{\partial y^2} = 0$

    c. $\frac{\partial}{\partial x}\left(K_x\frac{\partial h}{\partial x}\right) + \frac{\partial}{\partial y}\left(K_y\frac{\partial h}{\partial y}\right) = S_s\frac{\partial h}{\partial t}$

General Study Area: Geochemistry

1. Define Bowen's reaction series and explain how the relative rates of mineral weathering relate to Bowen's reaction series.

2. What are Piper Diagrams and what are they used for?

3. Describe the reaction of water and calcite in terms of geochemical reactions

4. What does the electrical conductivity of water sample describe about the ions in solution?

5. What is the difference between "parts per million" and milligrams/liter

6. Why is purging of three well volumes traditionally recommended before geochemical sampling in a well?

7. Describe the sorption process of metal ions on clay surfaces in terms of geochemical reactions.

8. Describe silicate weathering and its reaction products.

9. (a) Why do different primary minerals (igneous minerals) have different weathering rates and is there a pattern? Explain. What would be the compositions of waters resulting from the weathering of the following minerals to kaolinite?
    i. K-feldspar,
    ii. Na-feldspar,
    iii. Ca-feldspar

   (b) Ca-feldspar weathering and calcite weathering produce waters of similar chemical compositions. Are there differences? If so, what are the differences?

10. Explain the Gouy-Chapman Double Layer theory for the distribution of ions between solution and a solid surface. Relate Double Layer theory to the stability of colloids in both low and high ionic strength solutions. Describe one common example of colloid flocculation.

11. Define the term chemical divide and relate the concept to the evolution of water chemistry in closed basin lakes in the arid Western U.S. Assume that Na, Ca, Mg, HCO_3, and SO_4 are present (in variable proportions) in all starting water compositions. What are the possible chemical pathways for the evolution of the water chemistries? What factors might influence the starting water chemistry of any given closed basin lake?

12. Why do stable isotopes fractionate? Explain the latitude effect. How would you expect the local meteoric water line (LMWL) for groundwaters in the Truckee Meadows to plot relative to the global meteoric water line (GMWL)? What factors might influence the $\delta^{18}O$ and δD values of groundwaters and surface waters in the Truckee Meadows?

13. Calculate the solubility product of fluorite at 25ºC and at 50ºC. Is the reaction for fluorite solubility exothermic or endothermic? What is your evidence for determining exothermic vs. endothermic?

Table 2. Thermodynamic data

Formula	Form	ΔG^o, *kjoules*	ΔH^o, *kjoules*	S^o, *joules*
C	fluorite	-1167.3	-1219.6	68.9
C	aq	-553.6	-542.8	-53.1
F	aq	-278.8	-332.6	-13.8
H	l	-237.1	-285.8	69.9

Table 1. Chemical analyses of waters from the Floridan aquifer in central Florida.

Well	Location	TempºC	Field pH	SiO_2	Ca^{2+}	Mg^{2+}	Na^+	K^+	HCO_3^-	SO_4^{2-}	Cl^-	TDS
1	Polk City	23.8	8.0	12	34	5.6	3.2	0.5	124	2.4	4.5	138
2W	Lakeland	26.3	7.62	18	54	14	6.9	1.0	253	3.6	8.5	238
2S	Ft.Meade	26.6	7.75	16	58	17	6.1	0.7	163	71	9.0	272
3S	Wauchula	25.4	7.69	18	66	29	8.3	2.0	168	155	10	392
4S	Arcadia	26.3	7.44	31	106	60	21	3.7	206	344	28	726

Use the data in Table 1 above to answer the following 2 questions.

1. Is the Arcadia water analysis a good analysis? Show calculations to support your answer.

2. Plot the Arcadia water on a Piper diagram. Show calculations used in plotting.

General Study Area: Fluid Mechanics

1. Describe the terms that compose the Bernoulli equation.

2. Describe the terms in the Manning and Chezy equations.

3. What are the quantitative relationships between Manning's n, the Chezy C, and the Darcy-Weisbach, f?

4. What is Archimedes principle?

5. If one is standing on the bank of a rocky channel, describe a method that could be used to determine whether the flow is supercritical or subcritical without direct measurement.

6. In pipe flow what is meant by the terminology "minor loss?"

General Study Area: Hydrology

1. Define a unit hydrograph and how it is applied.

2. Describe two ways to determine a 25-year 1-hour storm event using 40 years of data.

3. What are differences between the rational method and the SCS curve number method when they are used to calculate peak runoff?

4. Name the principal components of the hydrologic cycle

5. Describe how one typically measures streamflow with a stream gage.

Graduate Program of Hydrologic Sciences

Ph.D. Comprehensive Exam Guidelines

INTRODUCTION

Admission to candidacy confirms that a student has successfully completed the program's course requirements and university residency requirements. In order to gain admission to candidacy, a student must meet all the following requirements.

1. Hold at least a "B" average in all graduate work
2. Gain the advisory/examining committees' formal approval for the program of study, including dissertation development
3. Successful completion of the qualifying examination

Students pursuing doctoral degrees should file for candidacy no later than eight calendar months prior to graduation. Although the examination should be taken after completion of all course requirements, it may be taken after a minimum of 75 percent of the student's required course work beyond the bachelor's degree is completed.

The purpose of this document is to provide a set of guidelines for faculty and students for the comprehensive exam process. The goal is to provide students with a better idea of what is expected of them in terms of preparation for the comprehensive exam. This will lead to better overall performance on the exam and will provide the examination committee with a consistent "ruler" by which to judge performance.

The comprehensive exam should test a student's ability to:

1. To determine how well prepared the student is to conduct Ph.D. level research in the general area the student has chosen
2. To determine the student's ability to convey the concepts they have learned in written and oral venues

Number one above is generally done with the written portion of the exam, while number two is generally done with the oral part of the exam.

EXAM COMPONENTS

The comprehensive examination should cover the breadth of knowledge within the field of hydrology that apply to the student's dissertation topic and will consist of a written portion and oral examination. The exam will be developed and administered by the student's dissertation committee with the advisor serving as the chair. All committee members are expected to participate in both the written and oral portions of the exam. In the event that **one** committee member cannot attend the oral exam, he/she may provide questions to the committee chair. Therefore, a minimum of four committee members must be present for the oral exam, and all members must provide written and oral questions.

The written exam may be closed book or open book. The exam should cover concepts related to the student's research area.

Time limits for closed book exams should be limited to two hours and can be proctored by a committee member or the student's advisor. The candidate is expected to achieve the equivalent of an A grade.

Time limits for open book exams should be less than one day (typically eight hours). The open book exams are expected to provide an opportunity for the candidate to demonstrate (and even extend) their knowledge of a subject area closely related to their research. Examples might include a question(s) that would demonstrate the candidate's ability to synthesize ideas and concepts from advanced courses. Other examples might be to give the candidate a particularly challenging "homework problem" from a course that the student has taken.

The oral exam is conducted at least two weeks following completion of the written exam and is typically three hours in length. Each committee member will ask about three questions, usually taking turns around the table. When we grant a Ph.D. degree, we are, in essence, giving the student a potential license to teach at the university level. As a result, the oral exam is designed to test the candidates' ability to think and react to questions in an articulate and coherent manner. The student should be able to articulate his/her understanding of complex concepts in front of an audience.

Students must register for the comprehensive exam (1 credit) for the semester in which the exam is to be taken. Students should register for the exam according to their advisor's departmental affiliation (e.g. GEOL 795, NRES 795). Students with advisors residing at the Desert Research Institute or a non-UNR institution should register for the exam in the department with which their advisor holds adjunct status. Comprehensive exam credits may be counted in the total credits required for the degree.

Following successful completion of the examination, the student must submit an Admission to Candidacy Form, which is available at http://www.unr.edu/grad/forms. The student's advisory committee, graduate director of the program and the Graduate Dean must approve the form.

PREPARING FOR THE EXAM

The best advice for candidates studying for the comprehensive exam includes the following:

- Study fundamental material
- Study actively, not passively (don't read about concepts, but practice explaining concepts as if you were teaching on the subject)
- Get together with other Ph.D. students and/or your advisor and practice explaining simple concepts out-loud and using the board
- Feel free to contact committee members to ask which subject areas that might be included in the exam

- Don’t forget to review undergraduate material in Physics, Chemistry, mathematics, and statistics

EXAM EVALUATION

After the completion of the written exams, each committee member must grade their portion of the exam within 6 days or less and notify the student’s advisor whether or not the student successfully passed those questions. If a committee member feels that the student performed poorly on a certain component of the written exam, he/she may ask follow-up questions during the oral exam. If more than one committee member feels the student has failed the written examination, the committee should decide if the student should retake the written exam, proceed on to the oral examination, or be dismissed from the GPHS.

At the end of the oral examination, the committee will vote on the success or failure of the examination process. In the event that **two or more** committee members cast negative votes, the examination (oral and/or written) may be repeated once if the committee approves additional study.

Graduate Program of Hydrologic Sciences
(Course Offerings - Updated Spring - 2016)

This list contains anticipated scheduling for those courses that may be related to the Hydrologic Sciences according to the online course catalog. The listing of courses is not meant to limit student choices and you are encouraged to seek out other courses that are appropriate for your research and studies. Instructors and offerings shown may change. Check the current course catalog for the most up-to-date information

DEPT.	##	CRED	TITLE	INSTRUCT.	SP16	FA16	SP17	FA17	SP18	FA18	NOTES
AGSC	608	5	Rangeland Ecosystems	Perryman			XX				See also NRES 608
AGSC	667	3	Natural Resource and Environmental Economics			XX		XX		XX	See ECON 667. May not be scheduled
AGSC	668	3	Economic Impact Analysis				XX				See ECON 668. May not be scehduled
APST	663	3	Design and Analysis of Experiments	Evans	XX	XX		XX		XX	May not be scheduled
APST	670	3	Linear Regression and Time Series	Evans			XX		XX		May not be scheduled
APST	705	3	Linear and Nonlinear Regression Models			XX		XX		XX	May not be scheduled
APST	755	3	Multivariate Statistical Methods				XX		XX		May not be scheduled
ATMS	610	3	Airflow and Weather Dynamics				XX		XX		May not be scheduled
ATMS	611	3	Intro. Atmospheric Physics	Bailey		XX		XX		XX	
ATMS	612	4	Intro. To Air Pollution	Gertler		XX		XX		XX	May not be scheduled
ATMS	613	3	Intro. Synoptic Meteorology	Kaplan		XX		XX		XX	May not be scheduled
ATMS	614	3	Physical Climatology	Lewis	XX		XX		XX		
ATMS	617	4	Airflow, Weather Dynamics, and Forecasting	Kaplan	XX		XX		XX		
ATMS	706	3	Applied Data Analysis			XX				XX	
ATMS	744	3	Advanced Synoptic Meteorology				XX				May not be scheduled
ATMS	746	3	Atmospheric Modeling						XX		May not be scheduled
ATMS	747	3	Atmospheric Chemistry	Samburova			XX				
ATMS	792	1-6	Special Problems								Depends on topic
BIOL	620	3	Aquatic Ecology	Peacock	XX				XX		
BIOL	631	3	Ichthyology	Peacock			XX				
BIOL	672	3	Limnology	Chandra		XX		XX		XX	
BIOL	712	3	Ecological Modeling				XX				May not be scheduled
CEE	364R	3	Engineering Hydrology	Marchand		XX		XX		XX	Will not get graduate credit
CEE	390R	3	Environmental Engineering Systems: Principles & Designs	Marchand	XX	XX	XX	XX	XX	XX	Will not get graduate credit
CEE	604	3	Open Channel Flow	Dennett	XX		XX		XX		
CEE	611	3	Environmental Law	Harris		XX		XX		XX	See NRES 612, PSC 403E. May not be scheduled
CEE	613	3	Water Resources Engineering I	Dennett			XX		XX		May not be scheduled
CEE	614	3	Water Resources Engineering II	Dennett							Not regularly scheduled
CEE	617	3	Quantitative Water Quality Analysis			XX		XX		XX	
CEE	618	3	Principles of Water Quality Modeling	Hiibel	XX		XX		XX		
CEE	653	3	Environmental Microbiology	Marchand		XX		XX		XX	
CEE	656	3	Design of Water Treatment Facilities	Dennett		XX		XX		XX	
CEE	657	3	Design of Wastewater Treatment and Reuse Systems	Pagilla	XX		XX		XX		
CEE	658	3	Environmental Chemistry Concepts and Design	Yang	XX		XX		XX		
CEE	659	3	Hazardous & Solid Waste Manag. & Control								Not scheduled
CEE	741	3	Geotechnical Eng. Seepage/Slopes/Embankments	Siddharthan	XX		XX		XX		
CEE	742	3	Advanced Soil Mechanics								Not regularly scheduled
CEE	750	1-3	Graduate Seminar	Variable	XX	XX	XX	XX	XX	XX	
CEE	751	4	Biological Unit Operations	Hiibel							Not regularly scheduled
CEE	752	4	Physicochemical Unit Processes	Hiibel							Not regularly sheduled
CEE	756	3	Environmental Chemical Kinetics	Yang	XX		XX		XX		
CEE	771	1-3	Special Engineering Problems	Variable	XX	XX	XX	XX	XX	XX	May not be water-related
ECON	615	3	Water Resource Economics and Policy	Stoddard			XX				
ECON	667	3	Natural Resource and Environmental Economics								Not scheduled
ECON	668	3	Economic Impact Analysis	Harris			XX				
ECON	767	3	Environmental Economics	Rollins	XX				XX		
ECON	769	3	Advanced Natural Resource Economics	Rollins			XX				May not be scheduled
ENG	691A	3	Major Texts of the Environmental Movement						XX		May not be scheduled
ENGR	600	3	Alternative Energy Fundamentals	Moltz	XX	XX	XX	XX	XX	XX	
ENGR	670	3	Geology of Geothermal Energy Resources	Boden	XX		XX		XX		
GE	684	3	Groundwater Hydrology	Tyler		XX		XX		XX	
GE	685	4	Waste Containment	Breitmeyer	XX		XX		XX		
GE	742	3	Debris and Snow Avalanches	Watters	XX						Not regularly scheduled
GE	743	3	Geostatistics	Carr			XX		XX		Not scheduled
GEOG	600	3	International Issues for Water Development	Berry/Saito		XX		XX		XX	Same as NRES 600
GEOG	605	4	Geographic Informations Systems I	Bassett	XX		XX		XX		
GEOG	607	4	Advanced GIS Analyses	Heaton		XX		XX		XX	
GEOG	609	3	GIS Design Studio	Patil			XX		XX		not scheduled
GEOG	611	3	Remote Sensing: Principles and Applications			XX				XX	
GEOG	616	3	Spatial Analysis	Biondi	XX		XX		XX		
GEOG	621	3	Climatology						XX		not scheduled
GEOG	622	3	Climate Solutions: Local to Global	Albright	XX		XX		XX		
GEOG	635	3	Conservation of Natural Resources	Albright	XX	XX		XX			
GEOG	637	3	Geography of Past Environments				XX		XX		not scheduled
GEOG	638	3	Western Water Resources Management	Ormerod	XX			XX			
GEOG	664	3	Identity and the Environment	Berry				XX			
GEOG	666	3	Environmental Planning and Policy						XX		not scheduled
GEOG	672	3	Geography of Arid Lands	Wigand	XX	XX				XX	
GEOG	701R	3	Advanced Geography (Climatology)	Csank	XX						Not regularly scheduled
GEOG	721	3	Advanced Climatology			XX				XX	
GEOG	737	3	Past Environmental Change	Mensing							Not regularly scheduled
GEOL	602	3	The Oceans			XX		XX		XX	
GEOL	614	3	Hydrologic Fluid Dynamics	Saito		XX		XX		XX	Same as NRES 614
GEOL	616	3	Environmental Geochemistry	Poulson	XX		XX		XX		
GEOL	641	3	Advanced Geomorphology	McCoy	XX		XX		XX		
GEOL	661	3	Paleobiology	Noble				XX			
GEOL	662	4	Micropaleontology			XX				XX	
GEOL	668	4	Advanced Sedimentology	Trexler					XX		Not regularly scheduled

Graduate Program of Hydrologic Sciences
(Course Offerings - Updated Spring - 2016)

DEPT.	##	CRED	TITLE	INSTRUCT.	SP16	FA16	SP17	FA17	SP18	FA18	NOTES
GEOL	701H	1-5	Climate Change - Past, Present and Future								Not scheduled
GEOL	701J	3	Fluvial Geomorphology or Sedimentology	Adams/Bullard/McCoy					XX		
GEOL	701S	3	Field Methods in Hydrology	Breitmeyer/Susfalk			XX		XX		
GEOL	712	3	Isotope Geochemistry					XX			
GEOL	713	2	Hydrothermal Geochemistry	Arehart	XX	XX				XX	
GEOL	716	3	Low Temperature Aqueous Geochemistry	Stillings			XX				not scheduled
GEOL	719	3	Geochemical Modeling Methods						XX		not scheduled
GEOL	763	3	Paleolimnology						XX		Not scheduled
GEOL	771	3	Hydrothermal Mineral Deposits	Muntean		XX				XX	Not regularly scheduled
GEOL	772	2	Hydrothermal Alteration and Vein Petrology			XX				XX	
GEOL	776	2-3	Fluid Inclusions in Hydrothermal Systems								Not Scheduled
GEOL	780	3	Isotope Hydrology	Thomas/Hershey		XX				XX	
GEOL	781	3	Advanced Surface Water Hydrology	Rajagopal			XX				
GEOL	782	1-2	Hydrology Seminar	Pohll/Schumer		XX		XX		XX	same as NRES 782
GEOL	783	3	Ground Water Hydraulics	Schumer	XX				XX		
GEOL	784	3	Vadose Zone Hydrology	Tyler				XX			
GEOL	785	3	Introduction to Groundwater Modeling	Pohll	XX		XX		XX		
GEOL	786	3	Ground Water Contaminant Transport	Cooper			XX				
GPH	692	3	Applied Geophysics	Louie	XX		XX		XX		
HIST	688	3	Creating North American Landscapes	Raymond/Randlett	XX				XX		
HIST	688B	3	Landscape of Lake Tahoe								Not regularly scheduled
MATH	620	3	Mathematical Modeling	Zaliapan/Telyakovskiy	XX	XX	XX	XX	XX	XX	Summer Session also occasionally
MATH	661	3	Probability Theory	Song	XX	XX	XX	XX	XX	XX	
MATH	666	3	Numerical Methods I	Solin		XX		XX		XX	
MATH	667	3	Numerical Methods II	Mortensen	XX		XX		XX		
MATH	688	3	Partial Differential Equations	Pinsky	XX		XX		XX		
MATH	753	3	Stochastic Models/Simulation					XX			
MATH	761	3	Methods Applied Math I	Telyakovskiy							Not scheduled
MATH	762	3	Methods in Applied Math II								Not scheduled
MATH	767	3	Advanced Mathematics for Earth Sciences								Not scheduled
ME	614	3	Intermediate Heat Transfer	Wirtz		XX		XX		XX	
ME	667	3	Intermediate Fluid Mechanics	Padilla	XX		XX		XX		
MINE	350	3	Applied Fluids, Pumping and Drainage	Danko		XX		XX		XX	Will not get graduate credit
MINE	725	3	Heat Mass Transport	Danko		XX				XX	Not regularly scheduled
NRES	600	3	International Issues for Water Development	Berry/Saito		XX		XX		XX	Same as GEOG 600
NRES	606	4	Ecophysiology of Forest and Range Plants	Nowak	XX		XX		XX		
NRES	608	5	Rangeland Ecosystems	Perryman			XX				See also AGSC 608
NRES	612	3	Environmental Law	Harris		XX		XX		XX	Same as CEE 611, PSC 403E. Not regularly scheduled
NRES	614	3	Hydrologic Fluid Dynamics	Saito		XX		XX		XX	Same as GEOL 614
NRES	622	3	Soil Physics	Sullivan	XX		XX		XX		
NRES	630	3	Analysis of Environmental Contaminants	Miller, G.			XX				
NRES	631	1	Analysis of Environmental Contaminants Laboratory	Miller, G.			XX				
NRES	632	3	Advanced Environmental Toxicology	Miller, G.		XX		XX		XX	
NRES	633	3	Environmental Chemicals:Exposure, Transport, Fate	Miller, G.	XX				XX		
NRES	640	4	Wetland Ecology and Management	Qualls	XX		XX		XX		
NRES	660	3	Rangeland Resource Management	Perryman			XX				
NRES	682	4	Small Watershed Hydrology	Harpold	XX		XX		XX		
NRES	693	3	Range and Forest Ecology	Weisberg	XX				XX		
NRES	694	3	Range and Forest Administration and Policy	Swanson	XX		XX		XX		
NRES	697	3	Forest and Range Soils	Sullivan	XX		XX		XX		
NRES	698	3	Rangeland Restoration Ecology					XX			
NRES	701C	1-3	Advanced Resource Management (various topics)	Various	XX	XX	XX	XX	XX	XX	
NRES	701D	1-3	Hydrology (various topics)	Various	XX	XX	XX	XX	XX	XX	not a regular course
NRES	702	3	Soil Biogeochemistry					XX			
NRES	720	3	Survivor Skills for Graduate Students in the Sciences	Gustin	XX		XX		XX		
NRES	730	3	Interdisciplinary Modeling	Saito					XX		Typically offered summer
NRES	765	3	Biogeochemical Cycles	Gustin		XX		XX		XX	
NRES	782	1-2	Hydrology Seminar	Pohll		XX		XX		XX	Same as GEOL 782
NRES	783	1	Water Conference Organization	Saito		XX		XX		XX	
NRES	784	3	Vadose Zone Hydrology	Tyler				XX			Same as GEOL 784
PHYS	604	3	Computational Techniques in Physics	Mancini				XX			
PHYS	701	3	Mathematical Physics	Case		XX		XX		XX	
PHYS	740	3	Fluid Dynamics	Guyer				XX			
PSC	603C	3	Environmental Policy	Wilds	XX	XX	XX	XX	XX	XX	
PSC	603D	3	Global Environmental Policy	Wilds	XX		XX		XX		Not scheduled
PSC	603E	3	Environmental Law	Harris		XX		XX		XX	see CEE 611 / NRES 612. Not regularly scheduled
PSC	603G	3	Land and Water Resource Policy								Not regularly scheduled
PSC	603M	3	Climate Change Mitigation and Adaptation Policy					XX			Not regularly scheduled
STAT	652	3	Continuous Statistics	Ahn	XX		XX		XX		
STAT	653	3	Discrete Statistics			XX		XX		XX	
STAT	753	3	Stochastic Models and Simulation				XX		XX		Not scheduled
STAT	755	3	Multivariate Data Analysis	Zaliapin			XX				
STAT	757	3	Applied Regression Analysis	Hurtado	XX		XX		XX		
STAT	758	3	Time Series Analysis	Zaliapin		XX				XX	

Graduate Program of Hydrologic Sciences

Graduate Assistantships

All graduate students holding an assistantship (teaching GTA or GRA) are considered Nevada residents for tuition purposes. Non-resident tuition is only waived for the duration of the assistantship. To be eligible for an assistantship, students must be admitted to a degree-granting program and be in good academic standing. The student must have an overall GPA of at least 3.0 and must be continuously enrolled in at least 6 graduate level credits (600-700) throughout the duration of the assistantship.

State-funded assistantships (GTA/GRA) may be held for a maximum of three (3) years for master's degree students and five (5) years for doctoral degree students.

General information about graduate assistantships is at http://www.unr.edu/grad/funding/graduate-assistantships.

The Graduate Assistantship handbook is at http://www.unr.edu/Documents/administration-finance/hr/hr-graduate/GA_handbook.pdf.

Graduate Program of Hydrologic Sciences

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Graduate Program of Hydrologic Sciences

Health Insurance

All domestic degree seeking graduate students, who are enrolled in six or more credits (regardless of the course level) in a semester, will be automatically enrolled and billed for the University sponsored health insurance for each term they are eligible (fall & spring/summer). If a student has other comparable coverage and would like to waive out of the student health insurance, it is the student's responsibility to complete the University online waiver form prior to the deadline. If approved, a health insurance waiver is good for the current academic year only. A new waiver must be submitted each academic year.

All international graduate students are required to carry student health insurance, and the cost will be automatically added to your student account. Any international graduate students with insurance questions must contact the Office of International Students and Scholars (OISS) directly.

More information is at http://www.unr.edu/grad/health-insurance.

STUDENT ORGANIZATIONS

GRADUATE STUDENT ASSOCIATION

The Graduate Student Association (GSA; http://www.unr.edu/gsa/) represents all graduate students and promotes the welfare and interests of the graduate students at the University of Nevada, Reno. The GSA works closely with appropriate university administrative offices, including the Graduate School and Student Services and reports to the President of the University. The GSA government functions through the Council of Representatives, Executive Council and established committees.

SAIWI

The Student Association for International Water Issues, or SAIWI (pronounced "Say-wee" or ['sA-wE] for you lexicographers) is a student organization at the University of Nevada, Reno, working to develop an understanding of global water issues and promote community empowerment through education and water resource development. Please visit the SAIWI website for more information (www.saiwi.org)

NWRA

The University of Nevada, Reno Student Chapter of the Nevada Water Resources Association was developed in 2014. Our Student Chapter is an active player in the water resources community of Nevada through the Colloquia series, community service and personal communication. The club organizes student participation in various conferences, social events that allow students, faculty and professionals to interact, educational and recreational field trips and community service projects.

Student Leadership

1. 2015-16 GSA Representative/GPHS Student Representative: Mary Kate Stewart (mkstewart@nevada.unr.edu)
2. 2015-16 NWRA Co-President: Brian Anderson (brian.anderson@dri.edu)
   2015-16 NWRA Co-President: Rowan Gaffney (rmg55@cornell.edu)
   2015-16 NWRA Co-President: Nicole Goehring (ngoehring@cabnr.unr.edu)
3. Fall 2015/Spring 2016 Colloquium Committee Co-Chair: Kelley Sterle (ksterle@unr.edu)
   Spring 2016/Fall2016 Colloquium Committee Co-Chair: Rachel Hallnan (rhallnan@nevada.unr.edu)
4. 2015-16 Aqua Clara Editor: Claire Archer (claire.archer2@gmail.com)
5. 2015-16 SAIWI Co-President: Elijah Mlawsky (elijahmlawsky@gmail.com)