

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 Graduate 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

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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
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