

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 the degree requirements and an attached listing of related graduate courses along with our prediction as to the schedule of future class offerings. Additional information about committee guidance and examination procedures can be found in the "GPHS Examination Procedures 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 each in verbal and 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 (PHYS 180 and 181) 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 Office for guidance on the appropriate courses for fulfilling deficiencies.

Students must provide evidence that the deficiencies were met if the 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 a three credit hours of seminar along with one course each in groundwater, hydrologic fluid dynamics, 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 the students' 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 those 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.

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)
GEOL/NRES 782	HYDROLOGY/HYDROGEOLOGY SEMINAR (3)

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 Hydrologic Sciences Program Office for more information and requirements.

All students are required to complete GEOL/NRES 782 twice for a total of 3 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 2 credits, 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 four (4) courses with Hydrogeology degree students aimed at providing the fundamentals of hydrologic fluid mechanics and introductions to ground water hydrology and environmental chemistry as well as three credits of seminar in Hydrologic Sciences.

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 Bachelors 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 Office for guidance on choice of plan options. In general however, the Plan B option should be considered as a terminal degree. For more information on credit requirements, students should consult the UNR General Catalog.

The Master's 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 a course in watershed hydrology to provide an overview/introduction of surface water processes and one or more specialization courses in surface water hydrology.

ADDITIONAL HYDROLOGY REQUIREMENTS

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

NRES 682 SMALL WATERSHED HYDROLOGY (4)*

*CEE 364 Engineering Hydrology or equivalent may be substituted with consent of your advisor

AND AT LEAST 1 OF THE FOLLOWING COURSES

ATMS 792	HYDROMETEOROLOGY (3)
CEE 618	PRINCIPLES OF WATER QUALITY MODELING (3)
GEOL 701J	FLUVIAL GEOMORPHOLOGY (3)
GEOL 701Z	FIELD METHODS (3)
GEOL 780R	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. The Doctoral degree in Hydrology requires 72 credits beyond the Bachelors 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) calendar years immediately preceding the granting of the degree.

Note that the GPHS does not generally accept students with only Bachelor’s 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 office 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 Office 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 (30 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 four (4) courses with Hydrology degree students aimed at providing the fundamentals of fluid mechanics and introductions to ground water hydrology and environmental chemistry as well as three credits of seminar in Hydrologic Sciences.

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's 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 Office for guidance on choice of plan options. In general however, the Plan B option should be considered as a terminal 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 Doctoral) are required to complete at least two of the following courses:

GEOL 701Z	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 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. The Doctoral degree in Hydrogeology requires 72 credits beyond the Bachelors 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) calendar years immediately preceding the granting of the degree.

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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 office 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.