



# DEPARTMENT OF CIVIL & ENVIRONMENTAL ENGINEERING GRADUATE HANDBOOK

2020-2021

Contains departmental  
policies for Graduate Degrees  
in: Civil Engineering, Nuclear  
Engineering, and  
Construction Engineering

## DEPARTMENT OF CIVIL & ENVIRONMENTAL ENGINEERING

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The Department of Civil and Environmental Engineering offers graduate study in the fields of: Construction Engineering (MS); Environmental Engineering (MS & PhD); Geotechnical Engineering (MS & PhD); Materials Engineering (MS & PhD); Nuclear Engineering (MS & PhD); Structural Engineering (MS & PhD); Transportation Engineering (MS & PhD); Water Resources Engineering (MS & PhD).

With diverse degrees and course offerings the department attracts students from a wide array of academic fields. This graduate handbook is intended to clarify expectations and processes for students in the department. Please note, students are responsible for knowing the expectations and policies contained within this document.

## VISION

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CVEEN education and research enables and advances safe, secure, and resilient civil infrastructure systems that address societal needs for sustaining modern standards of living. The department is a place where all students have the opportunity to be inspired by a challenging, stimulating, and supportive community and curriculum. Such intellectual inspiration is seen in the engagement of the civil infrastructure community of practice embracing excellence, ethics, and equality.

## MISSION

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The mission of the Department of Civil & Environmental Engineering at the University of Utah is to advance the smartness, resiliency, and sustainability of civil infrastructure systems.

The Department's education and research programs are grounded in scientific theories, yet modernized via an amalgam of systems engineering and advanced computing. The intellectual foundations in evolving and critical area address grand societal challenges for planning, designing, constructing and operating interdependent civil infrastructure systems, including building, infrastructure, environmental, energy, and health systems.

We strive to inspire and prepare students for high-impact careers in the engineering profession and in the broader societal context, and develop engineers with strategic skills in areas of emerging need, with the creativity to adapt and innovate in response to dynamic societal needs.

## WELCOME

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Thank you for reviewing the Department's Graduate Handbook. This document has been thoughtfully crafted to present information and policies applicable to graduate students in the Department of Civil and Environmental Engineering. Students should review the handbook prior to the start of each academic year to encourage the continued progress towards degree completion.

### *Other resources:*

- Students may also consult the Graduate Catalog concerning University policy available at: [gradschool.utah.edu/graduate-catalog](https://gradschool.utah.edu/graduate-catalog)
- Students should also review, Policy 6-400 the Code of Students Rights and Responsibilities, found at: [regulations.utah.edu](https://regulations.utah.edu)

## SAFETY AND WELLNESS

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**Your safety is our top priority.** In an emergency, dial 911 or seek a nearby emergency phone (throughout campus). Report any crimes or suspicious people to 801-585-COPS; this number will get you to a dispatch officer at the University of Utah Department of Public Safety (DPS; [dps.utah.edu](https://dps.utah.edu)). If at any time, you would like to be escorted by a security officer to or from areas on campus, DPS will help — just give a call.

The University of Utah seeks to provide a safe and healthy experience for students, employees, and others who make use of campus facilities. In support of this goal, the University has established confidential resources and support services to assist students who may have been affected by harassment, abusive relationships, or sexual misconduct. A detailed listing of University Resources for campus safety can be found at <https://registrar.utah.edu/handbook/campussafety.php>

Your well-being is key to your personal safety. If you are in crisis, call 801-587-3000; help is close. The university has additional excellent resources to promote emotional and physical wellness, including the Counseling Center (<https://counselingcenter.utah.edu>), the Wellness Center (<https://wellness.utah.edu>), and the Women's Resource Center (<https://womenscenter.utah.edu>). Counselors and advocates in these centers can help guide you to other resources to address a range of issues, including substance abuse and addiction.

## DEPARTMENTAL CONTACTS

Staff Member/ Role	Responsibilities with Graduate Students	Contact Info
Courtney Phillips; Graduate Advisor	Admissions; new student orientation; responsible for knowing University/ College / Department policy; tuition benefit / subsidized health insurance contact.	Office: MCE 2008 801 581 6678
Tiffany Hortin; Administrative Manger	Payroll; assigning student desks; reimbursements; manages the schedule for the department chair.	Office: MCE 2003 801 581 6192
Vacant Accountant	Department contact for travel; building access/ keys.	Office: MCE 2004 801 585 7710
Dr. Ramesh Goel; Director of Grad. Study	Chairs the Department Graduate Committee: responsible for reviewing student request for exception to policy.	Office: MCE 2064 801 581 6110
Dr. Michael Barber; Department Chair	Schedule appointments through Tiffany.	Office MCE 2002

## A REMINDER OF STUDENT RESPONSIBILITY.

Adapted from University Policy 6-400 (Available [in full here.](#))

*The mission of the University of Utah is to educate the individual and to discover, refine and disseminate knowledge. The University supports the intellectual, personal, social and ethical development of members of the University community. These goals can best be achieved in an open and supportive environment that encourages reasoned discourse, honesty, and respect for the rights of all individuals. Students at the University of Utah are encouraged to exercise personal responsibility and self-discipline and engage in the rigors of discovery and scholarship.*

*Students at the University of Utah are members of an academic community committed to basic and broadly shared ethical principles and concepts of civility. Integrity, autonomy, justice, respect and responsibility represent the basis for the rights and responsibilities that follow. Participation in the University of Utah community obligates each member to follow a code of civilized behavior.*

*The purposes of the Code of Student Rights and Responsibilities are to set forth the specific authority and responsibility of the University to maintain social discipline, to establish guidelines that facilitate a just and civil campus community, and to outline the educational process for determining student and student organization responsibility for alleged violations of University regulations. University policies have been designed to protect individuals and the campus community and create an environment conducive to achieving the academic mission of the institution.*

**The Department issues the reminder, that the degree is the student's own and, if applicable, the immigration record is the student's own. Departmental and University staff and faculty will provide input, advice and clarification to students, but ultimately any action, or in-action, is the student's own.**

## ADMISSIONS

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### Standard Application Process

1. Complete an Online ApplyYourself Application
2. Pay the appropriate application fee
3. Submit a personal statement
4. Submit a resume or Curriculum Vitae
5. Provide contact information for three references
6. Submit unofficial transcripts showing a completed bachelor's degree from a regionally accredited college or university, with a minimum of 3.00 or higher GPA on a 4.0 scale.
7. Request submission of Graduate Records Examination (GRE) taken within the last five years. *A minimum combined score of 300 on quantitative and verbal sections are required for review, for this degree.*

### A NOTE REGARDING THE GRE:

Students applying to the non-thesis coursework only degree option, are not required to submit GRE scores if they have a US accredited degree and a GPA of 3.20 or higher.

### TRADITIONAL PHD ADMISSION [CIVIL]:

Follow the standard application process above, no criteria modifications for this degree.

### DIRECT ADMIT PHD [CIVIL]:

Follow the standard application process above, criteria modifications for this degree listed below:

- A minimum GPA of 3.50 on a 4.0 scale.
- A minimum quantitative score of 155 and minimum combined score of 300 on quantitative and verbal sections are required for review, for this degree.

## REMEDIAL COURSEWORK FOR GRADUATE STUDY IN CIVIL ENGINEERING

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Students who hold degrees in other academic disciplines may be required to complete remedial coursework prior to the start of the graduate degree.

All Students Must Complete:	
Mathematics	
MATH 2250	Ordinary Differential Equations (and any prerequisite courses)
	A Statistics Course
Sciences	
PHYS 2210	Physics for Scientists and Engineers
CHEM 1210	General Chemistry 1
Basic Engineering	
CVEEN 2010	Statics
CVEEN 2140	Strength of Materials
CVEEN 3410/ 3415*	Hydraulics / Hydraulics Lab

\*CVEEN 3415 may be waived by supervisory committee if the student has successfully completed three or more labs in the prior degree.

Additional Requirements by Civil Engineering Graduate Emphasis:	
Environmental/ Water Resources	
CVEEN 3610	Introduction to Environmental Engineering
Materials	
CVEEN 3510	Civil Engineering Materials
Structures/ Geotechnical	
CVEEN 3210	Structural Load and Analysis
CVEEN 3310/ 3315	Geotechnical Engineering / Geotechnical Engineering Lab
CVEEN 4221	Concrete 1
CVEEN 4222	Steel 1
Transportation	
CVEEN 3520	Transportation Engineering

Additional coursework may be required by the supervisory committee. This is dependent upon the graduate academic emphasis and the prior degree awarded.

Students who have an undergraduate degree in a field that is **not** Civil Engineering and are completing a Master's program **must** complete the courses listed above- along with courses listed for their specific academic area of study in the second table. This includes those students who began studies as a PhD student, and have chosen to "Master-Out". These students also must have successfully complete and pass the classes listed above. Students may also be formally excused from a particular course(s) if reviewed and approved by the faculty in that particular area.

Students concluding their studies with a **Doctoral degree** from the Department of Civil and Environmental Engineering at the U of U only need to take remedial coursework as defined by the supervisory committee.

These Departmental requirements recognize the difference in the work that is done by a Master's-level engineer, and a doctoral-level engineer. It is for this reason that the remedial coursework differs by degree-level.

## REMEDIAL COURSEWORK FOR GRADUATE STUDY IN NUCLEAR ENGINEERING

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Nuclear Engineering is a unique academic field that attracts students with a wide variety of academic backgrounds. For this reason, the only requirement for students applying for Graduate Study in Nuclear Engineering is three semesters of Calculus. Students applying to the the nuclear engineering program commonly have an undergraduate major in one of the following areas: mathematics, physics, computer science, chemistry, biology, or in a related science field.

## NON-MATRICULATED STUDENTS

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Students who must complete coursework prior to application to the graduate program should apply to University of Utah as a non-degree seeking student. Once a student is accepted to the University as a non-degree seeking student, they should work closely with the Graduate Advisor to learn about any additional steps needed to enroll (i.e. permission codes). Coursework completed as a non-matriculated student may count towards a student's graduate program at the discretion of the student's supervisory

committee. Coursework completed as a non-matriculated student must receive a final grade of 'B' or better to apply towards a graduate degree. A maximum of **nine** non-matriculated credit hours may be applied to a graduate degree. International students on visas are not eligible for non-matriculated status.

## DEGREES OFFERED

BY DISCIPLINE	BY LEVEL OF STUDY
<b>Civil Engineering</b> Master of Science in Civil & Environmental Eng. Thesis Non-Thesis (coursework only) Doctor of Philosophy (PhD) Direct Admit: Bachelor to PhD Traditional: Masters to PhD  <b>Construction Engineering</b> Master of Science in Construction Engineering Non- Thesis (coursework only)  <b>Utah Nuclear Engineering Program (UNEP)</b> Master of Science in Nuclear Engineering Non-Thesis (coursework only) Doctor of Philosophy Direct Admit: Bachelor to PhD Traditional: Masters to PhD	<b>Master of Science</b> Non-Thesis (coursework only): Civil & Environmental Engineering Construction Engineering Nuclear Engineering Thesis: Civil & Environmental Eng.  <b>Doctor of Philosophy</b> Civil & Environmental Engineering Nuclear Engineering

## MASTERS:

### Credit Hour Requirements for Degree Completion.

The Graduate School requires candidates for master's degrees to devote a minimum of 30 credit hours to their graduate courses (i.e., courses numbered 6000 and above) and thesis. For thesis-based Master's degrees, a minimum of six credits of 6970 thesis research is required by The Graduate School. All coursework counted towards the degree must be approved by the student's supervisory committee.

- ☐ The candidate is required to maintain a 3.0 or higher GPA in coursework listed on the Program of Study for the master's degree.
- ☐ A grade below C- is not accepted by the University toward a graduate degree. Departments may have additional grade restrictions that must be maintained.
- ☐ At least 24 credit hours must be in resident study at the University of Utah.

Each academic group has identified core courses for students studying in the academic discipline. These listings are posted on the website, and in the appendix of this handbook.

#### I. MS Coursework Only (Non-Thesis)

##### a. Civil

##### *Important Information:*

- Graduate credit hours are listed as 5000 and above.
- Students can include no more than 9 credit hours of graduate level non-matriculated coursework, taken within 3 years of course approval, with a final grade of B or better.
- Students can apply no more than 6 credit hours of graduate level coursework from another institution, with a final grade of B or better. This credit may not have counted towards the completion of a prior degree.

The Master's Non-Thesis Degree is awarded for the completion of ten graduate-level courses (30 graduate credit hours) approved by the supervisory committee.

*Credit requirements:* A minimum of 30 credits of approved coursework (courses 5000 and up)  
(15 Core and 15 Elective credits -*Infrastructure students only*)

**TOTAL:** A *minimum* of 30 graduate credit hours

In addition to coursework and credit requirements, non-thesis students must take and pass a comprehensive essay exam in their final semester of study. The exam is sent to non-thesis students in their final semester of study approximately two weeks into the academic semester, and must be returned to the Graduate Advisor by the date specified.

##### b. Nuclear

##### *Important Information:*

- Graduate credit hours are listed as 5000 and above.
- Students can include no more than 9 credit hours of graduate level non-matriculated coursework, taken within 3 years of course approval, with a final grade of B or better.
- Students can apply no more than 6 credit hours of graduate level coursework from another institution, with a final grade of B or better. This credit may not have counted towards the completion of a prior degree.



- Up to 3 credits of independent research, taken as NUCL 6900 or 7900.
- Up to 12 credits of electives offered by other departments in engineering, science, and math-related disciplines that complement the student's research. Elective courses may be taken in any science, engineering, technology discipline that supports your research.

1. Required Courses.	2. Choose a minimum of FOUR additional NUCL electives from the list below.
NUCL 6030: Graduate Radiation Interactions (3 cr.) NUCL 6050: Reactor Physics (3 cr.)	NUCL 5060: Reactor Operation and Regulatory Policy (3 cr.) NUCL 6032: Graduate Radiochemistry (3 cr.) NUCL 7110: Nuclear Environmental Engineering (3 cr.) NUCL 7220: Analytical Nuclear Forensics (3 cr.) NUCL 7000: Health Physics (3 cr.) NUCL 7500: Nuclear Safeguards (3 cr.) NUCL 7100: Nuclear Instrumentation (4 cr.) MET E 6210: Nuclear Materials (3 cr.) CVEEN 6120: Numerical Methods (3 cr.)

MS students must complete a minimum of 30 hours of graduate level coursework.

II. MS Thesis- Civil Only.

The MS-Thesis is awarded for scholarly achievement of coursework and research and requires a successful defense of the thesis to complete the degree. Research is conducted with close supervision by the student's faculty advisor and committee and results in a defense and publication of a thesis, making a contribution to the student's interest area. The University of Utah allows, and the department encourages, students to use peer-reviewed journal articles to fulfill the thesis requirement. Master's thesis typically consists of at least one journal quality article with additional explanatory material and appendices, as necessary. The student's graduate committee is responsible for evaluating the research and publications; ultimately determining if the quality merits the degree sought, regardless of the number or status of the articles.

Beginning in Fall 2020 CVEEN 6555: Research and Seminar is required for all students completing a research degree. This can be counted towards the 24 credit hours of required coursework.

<i>Credit requirements:</i>	A minimum of 24 credits of approved coursework (courses 5000 and up) (15 Core and 9 Elective credits)
+ _____	<u>A minimum of 6 credits of research.</u>
<b>TOTAL:</b>	<b>A minimum of 30 graduate credit hours</b>

**Supervisory Committee Formation:**

### What is a supervisory committee?

A supervisory committee guides and assists a student in working toward a graduate degree.

All appointed supervisory committee members are voting members of the supervisory committee. These individuals are productive scholars in the student's major field and/or sub-fields.

*Decisions concerning program requirements, examinations, and the thesis or dissertation are made by majority committee vote.*

Student: the student's responsibilities relating to their supervisory committee include:

- 1) providing all members with a short summary of the program of study and research interests and an examination timeline;
- 2) providing necessary General Examination materials to all committee members in a timely manner;
- 3) providing necessary Final Examination materials to all committee members in a timely manner (this includes a draft of the entire dissertation to reading committee members);
- 4) keeping the committee membership current and notifying the department's Graduate Advisor of any committee changes in a timely manner

What are the responsibilities of the supervisory committee?

- For a non-thesis (coursework-only) student the committee holds two main responsibilities:
  - 1) Committee members ensure the coursework you select will provide for you the education needed to be a successful Master's-Level Engineer.
  - 2) Committee members will evaluate the non-technical comprehensive exam completed in the student's final semester of study.
- For a thesis student the supervisory committee is responsible for:
  - 1) assessing the student's foundational knowledge, and formally noting deficiencies and any supplementary coursework for which no credit is granted;
  - 2) approving a course of study which will fulfill the general requirements of the degree;
  - 3) approving the thesis or dissertation subject,
  - 4) reading and approving the thesis or dissertation,
  - 5) administering and judging the final oral examination (thesis or dissertation defense).

In addition to the voting member responsibilities, the chair(s) of a committee must:

- be able and willing to assume principal responsibility for advising the student;
- have adequate time available for this work and be accessible to the student;
- attend both the General and Final Examinations and additional committee meetings, as necessary;
- sign the dissertation signature page acknowledging approval of the dissertation and completion of the degree

Who can serve on a supervisory committee?

- All University of Utah faculty members are eligible to serve as supervisory committee members.
- The faculty member must hold the terminal degree in the relevant field, and/or have demonstrated research and scholarly work in the field.
- Committee chairs must be selected from tenure-line faculty.
- Persons from outside the University of Utah may serve as committee members with approval of the Dean of The Graduate School.
- Immediate family members are not eligible to serve on a student's supervisory committee.

The masters committee will be comprised of three members. The majority of these members must be core faculty within the department, in the student's area of study.

Role	Requirements
1. Chair	Tenure-line in home department.
2. Member 2	Tenure-line in home department.
3. Member 3	Another PhD

Nuclear Committees must have two Nuclear Core Faculty. As of August 2020 these faculty members are: Dr. Ed Cazalas, Dr. Luther McDonald, Dr. Tara Mastren, Dr. Glenn Sjoden.

#### Examinations:

##### *Coursework-only degree:* [Civil & Nuclear]

Students completing on of the MS non-thesis degrees will take an examination in their final semester of study. This examination is sent to students on the second Friday in the student's last semester of study (also the University add/drop date). The materials the student can expect to receive at that time are an essay prompt to be completed by the student, and re-submitted to the Graduate Advisor on or before the date specified (typically 6-8 weeks later). This examination may call upon the student's knowledge gained while completing graduate study at the University of Utah. Upon submission. This document will be provided to the student's supervisory committee for evaluation and a vote of "Pass" or "No Pass". The result of the examination is determined by majority committee vote. In the event "No Pass" is determined the student should expect to complete an oral examination from the supervisory committee.

##### *Thesis-based degree:* [Civil]

Master's and doctoral candidates must submit a thesis or dissertation "...embodying the results of scientific or scholarly research or artistic creativity which gives evidence of originality and ability in independent investigation and is a contribution to knowledge or the creative arts." Manuscripts "... must show a mastery of the relevant literature and be represented in acceptable style. The style and format. . . are determined by departmental policy and registered with the thesis editor, who approves the style and format of individual [theses and] dissertations in accordance with departmental policy" (University Regulations Library 6-203-III-F).

Students should take the time to familiarize themselves with both the department, and University process concerning the Thesis including: submission deadlines, formatting requirements, current submission procedures. Further resources can be found at: [gradschool.utah.edu/thesis](https://gradschool.utah.edu/thesis)

## DOCTORAL STUDY:

### Degree requirements, as defined by the Graduate School:

The Doctor of Philosophy degree is awarded for high achievement in an advanced specialized field of study. It requires competence in independent research and an understanding of related subjects. *The degree is not awarded simply for the fulfillment of residence requirements and the accumulation of credits.* All requirements outlined for Master's Degree completion must also be met.

- ☐ The candidate is required to maintain a 3.0 or higher GPA in course work listed on the Program of Study for the master's degree.
- ☐ A grade below C- is not accepted by the University toward a graduate degree. Departments may have additional grade restrictions that must be maintained.
- ☐ At least one year (i.e., two consecutive semesters) of the doctoral program must be spent in full-time academic work at the University of Utah. A full load is nine credit hours.

### Residency Requirement, Additional Information:

When a student proceeds directly from a master's degree to a Ph.D. degree with no break in the program of study (except for authorized leaves of absence), the residency requirement may be fulfilled at any time during the course of study.

Three hours of Thesis Research: Ph.D. (course number 7970) is also considered a full load after the residency requirement is fulfilled. Beginning in Fall 2020 CVEEN 6555: Research and Seminar is required for all students completing a research degree. This can count towards the required coursework credits. Area specific requirements are outlines in the pre-approved courses linked

### Credit Hour Requirement:

- I. Direct Admit PhD (BS to PhD)  
Minimum Credit Hour Requirements:  
30 credit hours of coursework  
+ 14 credit hours of dissertation research (CVEEN/ NUCL 7970)  
44 credit hours
- II. Traditional PhD (BS to MS to PhD)  
Minimum Credit Hour Requirements:  
18 credit hours of coursework  
+ 14 credit hours of dissertation research (CVEEN/ NUCL 7970)  
32 credit hours

### Supervisory Committee Formation:

Please read the information provided in the Master's Section regarding the supervisory committee expectations.

The doctoral committee will be comprised of five members. The majority of these members must be core faculty within the department, in the student's area of study.

There are two rules that all PhD committees must follow:

1. The committee chair and the majority of the committee must be tenure-line faculty in the student's department.
2. One member of the committee must be appointed from outside the student's major department.
  - a. The outside member is normally from another University of Utah department.
  - b. The dean of The Graduate School may approve requests to appoint a committee member from another university where appropriate justification and supporting documentation is provided.

Role	Requirements
1. Chair	Tenure-line in home department
2. Member 2	Tenure-line in home department
3. Member 3	Tenure-line in home department
4. Member 4	Typically another faculty within the department
5. Member 5	Outside member. Another PhD. (Outside department or U of U).

Nuclear Committees must have three Nuclear Core Faculty. As of August 2020 these faculty members are: Dr. Ed Cazalas, Dr. Luther McDonald, Dr. Tara Mastren, Dr. Glenn Sjoden.

#### Examinations:

##### *I. Preliminary Exam [Civil]*

The purpose of the Preliminary Examination is to determine the student's overall background and qualifications to continue in the graduate program towards a degree of Doctor of Philosophy. Students should submit a tentative CDP to their chairperson before the exam. Typically the Preliminary Examination is taken no later than the second semester of a Ph.D. program to help identify the student's understanding of basic principles and background, synthesis of knowledge, and general academic preparation (courses deemed necessary) to successfully pursue the Ph.D. program.

*Scheduling:* The Preliminary Examinations will be scheduled the Friday after fall break or spring break. New students enrolled in the Ph.D. program must take the Preliminary Examination no later than the end of their second semester at the University of Utah. Students who completed their M.S. at the University of Utah may be required by their Supervisory Committee to take the exam no later than the end of the first semester of the Ph.D.-level study. The Preliminary Exam must be completed at least one semester prior to the Research Proposal. Students must be registered for three or more credit hours during the semester of the exam. If the required date of the Preliminary Examination passes without the examination being attempted, the student must obtain written permission from the Chair of the Department to continue attending civil engineering courses. Before the end of the second semester, the Preliminary Examination and the CDP should be complete and submitted.

*Procedure:* The examination may be written and/or oral. The student will be told which format will be used and the general topics to be covered before the exam date. The Preliminary Examination addresses prior coursework related to each student's area of study. In many programs, written and oral questions will contain material from texts and/or notes which the students have had available for study. Questions for an oral exam may be written and given to the student's faculty advisor prior to the examination. Secondary (follow-up) questions are permissible in an oral examination.

*Results:* The Supervisory Committee shall determine one of the following results: (1) pass the student and recommend a program of study to support the student's research and begin preparations for the Qualifying Examination; (2) recommend a strengthening of the fundamentals in the student's research area and outline a course of study for this purpose. In this case the examination must be retaken at a later date as determined by the Supervisory Committee; or (3) terminate the student from the Ph.D. program if they fail twice. The results of the examination will be recorded in memo format from the group lead reported to the department academic advisor and committee chair, and placed in the student's departmental file. A student is considered to be a Ph.D. student upon successful completion of the Preliminary Examination.

*II. Qualifying Exam: [Nuclear procedure]*

The Nuclear Engineering Ph.D. Qualifier Examination will consist of a **two-part examination**—a written examination (Part I), worth 75% overall, and a technical presentation examination (Part II), worth 25% overall.

Part I: Written exam (75% of overall score). The Nuclear Engineering Written Examination covers the basic fields of Nuclear Engineering as taught in the four core graduate courses. The level of competency will be set at the advanced graduate level.

Part II: Technical Presentation (25% of overall score). The Nuclear Engineering Technical Presentation Examination is described as follows. The Ph.D. candidate's research advisor selects a journal article related to the candidate's field of study, and students are allotted 1 week to research it, identify technical issues, analyze data in the article, etc, and produce a 20-30 minute presentation on the article to the QE faculty, and entertain questions. Also, in Part II, students may be asked questions (e.g. perform potential board work) on any problems attempted from the written exam, or fundamental concepts in nuclear engineering, particularly those noted where the student may have struggled with the material.

**Passing Criteria:** Students must receive a passing grade on both Parts I and II. Students must receive an overall minimum of 70% to move on to the research proposal. An overall score of 60 – 70% will yield a conditional pass. Students receiving a conditional pass must meet with their Supervisory Committee prior to moving on to the research proposal. Any score below a 60% is a failure.

**Repeating the Exam.** Students failing any portion of the QE may not undertake the research proposal in the same year. Moreover, if a student passes one part but fails another, only that part which resulted in a failure must be repeated. For example, if the student passes Part I, but for any reason fails Part II, only Part II must be repeated. NOTE: The QE exam committee may also further recommend completion of auxiliary courses to better prepare the candidate and correct deficiencies noted, as required.

### *III. The Research Proposal: [Civil procedure]*

*Procedure:* The student shall present a written research proposal to each Supervisory Committee member at least three weeks prior to the exam. This document shall be written in a scholarly manner and include a history of the problem, the proposed scope of the investigation, and a statement of the original research contribution. The exam consists of a formal presentation by the student followed by questions from the Supervisory Committee. The Supervisory Committee determines if the candidate:

- (1) has sufficient ability and comprehensive knowledge to conduct the research,
- (2) has reviewed the literature sufficiently,
- (3) has proposed research which has a scope worthy of a Ph.D. degree, and which should produce an original and acceptable research contribution.

The student determines the current state of knowledge and identifies unsolved aspects of a topic to do for a research proposal. In consultation with the supervisory chair, the student selects one of the unsolved problems and develops an idea, which might lead to an acceptable solution by means of experimental and/or analytical research. The student then prepares a written proposal, which presents the research problem and a proposed approach to the solution. The proposal should be double spaced and approximately 20 typewritten pages. Additional details of literature review, methodologies, preliminary results, and others requiring additional space may be included as appendices are not subject to the page limit. The student must share the completed proposal to the committee members a minimum of two weeks before the scheduled proposal defense.

Ordinarily the research proposal will be organized as follows:

1. Abstract
2. Introduction
3. Literature Survey
4. Proposed Research Program
5. Nomenclature 6. References

All members of the student's Supervisory Committee, or in the case of necessary absences, substitutes pre-approved by the Graduate School, shall participate in the Qualifying Examination.

*Results:* The Supervisory Committee shall (1) approve the research proposed, (2) approve the research proposed with revisions, (3) reject the research proposed with specific reasons given and recommendations, or (4) terminate the student from the Ph.D. program. Results 1 and 2 constitute passing; results 3 and 4 constitute failure. A student is considered a Ph.D. Candidate upon passing all components of the Qualifying Examination.

The Research Proposal: [Nuclear Procedure]

This is the project summary from the current NEUP. Modified it to remove reference to DOE.

All documentation is to be prepared using standard 8.5" × 11" paper with 1-inch margins (top, bottom, left, right), using a font size no smaller than Times New Roman 11 point. The documentation provided shall include the items specified below:

- Application title.
- Project Objectives: Provide a clear, concise statement of specific objectives/aims of the proposed project.
- Proposed scope description.
- Logical path to accomplishing scope, including descriptions of tasks. This section will provide a clear, concise statement of the specific objectives/aims of the proposed project. This section should be formatted to address each of the merit review criteria below. Provide sufficient information so that the Committee will be able to evaluate the application in accordance with these merit review criteria.
- Relevance and Outcomes/Impacts: This section will explain the program relevance/priority of the effort to the objectives in the program announcement and the expected outcomes and/or impacts.
- Schedule: Define timelines for executing the specified work scope, including all important activities or phases of the project.
- Milestones and deliverables.
- Type/Description of facilities that will be used to execute the scope (if applicable).
- Unique challenges to accomplishing the work and planned mitigations.
- Information, data, plans, or drawings necessary to explain the details of the application.

*The page limit including cover page, table of contents, charts, graphs, maps, photographs, tables, references and other pictorial presentations while complying with the document format instructions is 10-pages.*

#### Review Criteria

Criterion 1 – Advances the State of Knowledge and Understanding and Addresses Gaps in Nuclear Science and Engineering Research:

- The technical merit of the proposed R&D project will be evaluated, including the extent to which the project advances the state of knowledge and understanding and addresses gaps in nuclear science and engineering research.
- Evaluation will consider how important the proposed project is to advancing knowledge and understanding within the area selected and how well the proposed project advances, discovers, or explores creative, original, or potentially transformative concepts.

Criterion 2 – Technical Quality of the Proposed R&D Project:

- The Committee will evaluate the overall quality/acceptability of the proposed R&D project. In evaluating this criterion, the Committee may consider the
  - (1) merit, feasibility, and realism of the proposed methodology and approach to the project;



- (2) schedule, including sequence of project tasks, principle milestones, and times for each task;
- (3) proposed project efficiencies; and
- (4) technical expertise available to the applicant in carrying out the project.

Criterion 3 – Applicant Capabilities, Risks, and Experience:

- The Committee will evaluate the extent to which the applicant provides objective evidence that he/she has the resources and abilities to successfully complete the R&D project in a technically defensible manner.
- This will be evaluated from a description of the student's current activities, experience, capabilities, and past performances, demonstrating the likely successful completion of the R&D objectives.

Eligibility for Increase in Pay

Civil students are eligible for a pay raise after successfully completing the *preliminary examination* AND the *research proposal*.

Nuclear students are eligible for a pay raise after successfully completing *qualifying examination* AND the *research proposal*.

#### IV. *Dissertation Defense:*

**The Document:** The candidate must submit a dissertation embodying the results of the scientific or scholarly research, which gives evidence of originality and ability to conduct independent investigation, and is a contribution to knowledge. The dissertation must show a mastery of the relevant literature and be presented in acceptable style. The dissertation must receive approval by the student's supervisory committee.

**The Defense:** A final oral examination must be passed before graduation. The examination must follow receipt of the dissertation by the supervisory committee. The committee schedules and announces a public oral examination at which the candidate must defend the dissertation. The final oral examination may be chaired by any member of the supervisory committee consistent with departmental policy.

**Scheduling:** For best planning, candidates should identify a rough timeline for the final defense one- to two-semester in advance. (This is especially important for students studying on a Visa.) The candidate should consult early with committee members to find out availability and scheduling constraints during the anticipated semester of the final defense. Many students use a free Doodle poll to identify the date and time of the scheduled defense. Determine at this time if the defense will take place in-person, via videoconferencing or in-combination. Consult with the Graduate Advisor to reserve presentation space, and their time if needed to help facilitate the video conference defense. Please note, the dissertation must be reviewed, edited and approved by the chairperson and the final draft of the dissertation provided to the entire committee a minimum of three weeks prior to the scheduled defense.

**Procedure:** As outlined above, the student must provide the approved dissertation manuscript to the full supervisory committee a minimum of three weeks prior to the scheduled defense. At this same time, the student should provide the committee members with the digital manuscript evaluation form. This document ensures the committee members read the dissertation prior to the defense, and include their comments for correction/ improvement. The students should also submit the digital defense announcement form, so that the event can be shared publicly.

During the defense, the committee chair shall introduce the candidate and outline the defense procedure. The candidate shall then present the doctoral research findings to the committee and public. After the presentation, questions will be invited from all present. When there are no further questions from the friends and family members present, the committee chair will state that the public portion of the defense has concluded and those present who are not on the committee should go on their way/ sign off the Zoom call. When it is only the committee and the defending student present, questioning can resume until all committee members have exhausted their questions. The supervisory committee then has a private discussion and determines one of the following.

**Results:** The Supervisory Committee may:

1. Accept the Dissertation as presented, thereby declaring that the candidate has successfully defended the doctoral research and declares the defense complete with minor corrections.
2. Require modification of the Dissertation, giving conditional acceptance.
3. Modification of the Dissertation, and a second defense. In the event a candidate fails a second defense, they shall be dismissed from candidacy.

The student will work with their Supervisory Committee to make the necessary changes, follow the Thesis Submission Procedure.

**Please use the document on the following pages as an aid in the final year, of study.**

	DEPARTMENT	THESIS OFFICE/ GRADUATE SCHOOL	ISSS If Applicable.	IMPORTANT DATES
BEFORE THE DEFENSE	<input type="checkbox"/> Three-weeks before the defense send the Thesis/ Dissertation to the committee with the Manuscript Evaluation. <input type="checkbox"/> Complete the Defense Announcement. <input type="checkbox"/> Prompt committee members to complete the manuscript evaluation. <input type="checkbox"/> Consider one-on-one meetings with committee members to prepare.	<input type="checkbox"/> Apply for <a href="#">Graduation in CIS or Late/ Re-Application Form</a> . <input type="checkbox"/> Use the <a href="#">templates</a> provided. <input type="checkbox"/> Schedule a one-on-one meeting with a Thesis Office editor. <input type="checkbox"/> Discuss specifics if there accepted, but not yet published papers. <input type="checkbox"/> Submit <a href="#">co-author information</a> . <input type="checkbox"/> Submit <a href="#">proof of copyright permission</a> .	<input type="checkbox"/> Submit <a href="#">last semester notification</a> through UAtlas. <input type="checkbox"/> <a href="#">Apply for OPT</a> .	<a href="#">Apply for Graduation</a> through CIS:  Date: _____   Thesis Office: Target Dates for Submission THE LAST DATE TO SUBMIT, AND REMAIN IN CONSIDERATION FOR GRADUATION THAT TERM  Preliminary Review: _____
	Notes:			
	DEPARTMENT	THESIS OFFICE/ GRADUATE SCHOOL	ISSS If Applicable.	IMPORTANT DATES
FOLLOWING THE DEFENSE	<input type="checkbox"/> Committee signs off digitally documenting outcome of defense via Adobe. <input type="checkbox"/> Make edits to manuscript per committee's suggestions. <input type="checkbox"/> Once complete, email PDF document to Graduate Advisor. <ul style="list-style-type: none"> <li>- Advisor shares document with Dept Chair (via UBox).</li> <li>- Advisor provides the committee member's UNIDs</li> </ul>	<input type="checkbox"/> Submit to the Thesis Office following current procedures. <input type="checkbox"/> Diligently check emails following submission. <input type="checkbox"/> Following Thesis Office approval submit to ProQuest. <input type="checkbox"/> Need a verification for employment? Inform the Graduate Advisor.	<input type="checkbox"/> Inform Graduate Advisor of Program End Date.	Thesis Office: Target Dates for Submission THE LAST DATE TO SUBMIT, AND REMAIN IN CONSIDERATION FOR GRADUATION THAT TERM  Final Submission: _____  ProQuest Upload: _____
	Notes:			

Earliest day USCIS can receive application

Program End Date

Last day USCIS can receive application

90 days

60 days

OPT Application Window

90 days before program end date – 60 days after

RECOMMENDED TO APPLY AROUND THIS TIME

Choose any day within 60 days after program end date for OPT start date.

Requested EAD Start date

06/01

Submitted to USCIS

Approved Start Date

90 days for processing by USCIS

1 2 3 4 5 6 7 8 9 10 11 12

Enjoy your 11 months of OPT - Limit of 90 days of unemployment

You cannot legally begin working until you have the physical card AND the start date has been reached!

POST OPT Timeline

Spring Completion Scenario 1:

Apply early! Good timing

Your OPT must end within 14 months of your program end date

OPT authorization period.

Varies depending on requested start date, application submission date and USCIS processing time.

Possible 12 month initial OPT Scenarios

Example: On February 1st, Eddie mails his application for Post OPT to the USCIS. He is completing his program on May 1<sup>st</sup> and chooses June 1<sup>st</sup> as the OPT start date because he plans to be available to start work on that day. He Receives the EAD on May 5<sup>th</sup>. His employer is pleased to see proof of the work permission early even though he cannot start working until June 1<sup>st</sup>, as noted on the EAD.

Earliest day USCIS can receive application

Program End Date

Last day USCIS can receive application

90 days

60 days

OPT Application Window

90 days before program end date – 60 days after

RECOMMENDED TO APPLY AROUND THIS TIME

Choose any day within 60 days after program end date for OPT start date.

Requested EAD Start date

06/01

Submitted to USCIS

Approved Start Date

90 days for processing by USCIS

1 2 3 4 5 6 7 8 9 10 11

Enjoy your 11 months of OPT - Limit of 90 days of unemployment

You cannot legally begin working until you have the physical card AND the start date has been reached!

POST OPT Timeline

Spring Completion Scenario 2:

Apply late, lose some OPT time!

Your OPT must end within 14 months of your program end date

OPT authorization period.

Varies depending on requested start date, application submission date and USCIS processing time.

Possible 12 month initial OPT Scenarios

Example: Cappie completed her program May 1<sup>st</sup>. She requests June 1<sup>st</sup> as her start date, and submits her Post OPT application to the USCIS on May 1<sup>st</sup>. On June 1<sup>st</sup>, Cappie still hasn't received her EAD, so she can't work. Cappie receives her EAD and has the start date of August 1<sup>st</sup> and it expires the following year on June 30<sup>th</sup>. Cappie has lost 1 month of her 12 month OPT because her application was approved after 60 day grace period. OPT EAD cards can't be backdated, but the OPT has a maximum end date which is no more than 14 months from program completion.

## APPENDICES

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### 1. WHAT HAPPENS IN THE EVENT THE SUPERVISORY COMMITTEE CHAIR LEAVES THE UNIVERSITY OF UTAH?

For students that are going to graduate within a year of a faculty departure they can stay on as the main advisor without an appointment. This is only if a student will get done in a year. If it will take more than one year's time from the faculty departure, the student should amend the supervisory committee.

### 2. PREGNANT GRADUATE ASSISTANT\* ACCOMMODATION POLICY, COLLEGE OF ENGINEERING, UNIVERSITY OF UTAH

\* Graduate Assistant refers to all of the following graduate students: Research Assistants, Teaching Assistants, and other Graduate Assistants who are not classified as Research Assistants or Teaching Assistants

- 1) Pregnant graduate assistants including research, teaching, or other graduate assistants can request, and may be granted, up to 6 weeks of leave for childbirth or childbirth-related medical conditions for the period prior to, during, and after childbirth. As long as a pregnant graduate student is employed during the leave period for at least 0.25 FTE, they will continue to receive pay during their leave.
- 2) Pregnant Research Assistants: If there is a risk that the project the research assistant is working on will suffer delays, the PI of the project funding the pregnant research assistant must formally request accommodations from the funding agencies to account for any delays in project completion. The PIs should use existing project funding (if the project allows) or obtain additional funding, if possible, to pay the pregnant research assistant during her leave. Only when no such additional funding is available from the sponsor, or from PI discretionary sources, returned research overhead from the department/school may be used to cover the pay for pregnant research assistants during their 6-week childbirth leave.
- 3) Pregnant Teaching Assistants or other Graduate Assistants: Differential tuition available to the department/school may be used to cover the pay for pregnant teaching assistants or other graduate assistants (who are not research assistants) during their 6-week childbirth leave.
- 4) Students on Fellowships:
  - a) Fellowships from University sources, that are paid through the Scholarship Office, will not be interrupted during the 6-week leave period as long as the student on leave continues to maintain her graduate student status by being enrolled and registered for the required number of credit hours.
  - b) Students who are given paid graduate assistant positions that the departments call "fellowships" are really GAs; they fall under point 3 above.
  - c) Students who are supported by fellowships from external sources (NSF, NIH, etc.) are subject to the rules and regulations of the granting agency with respect to leave from academic and research work. If they are required to suspend their externally funded fellowship, they should be treated like graduate research assistants, and their pay may be covered through returned research overhead of the department/school.
- 5) The pay during the 6-week leave period for any teaching, research, or other graduate assistant will be the same as without the pregnancy, except that it cannot exceed 0.5 FTE irrespective of their effort before and after the leave. For example, a student being paid at 0.5 FTE as a research assistant will continue to receive their pay at 0.5 FTE during the 6-week leave. However, if the student were paid at 1.0 FTE, they can be paid only 0.5 FTE during their leave period.
- 6) Tuition and fees still apply during the 6-week leave period. Any tuition benefits being received by the student will continue during the 6-week leave period as long as they continue to maintain their graduate student status by remaining enrolled and registered for the required number of credit hours.

- 7) State funds cannot be used to pay for the 6-week leave period.
- 8) This policy applies only to pregnant students (birth mothers) and not to their family members.
- 9) All pregnant students with graduate status, and being paid as a research, teaching, or other graduate assistant at 0.25 FTE or more, are eligible for this accommodation.
- 10) Graduate students who are not employed as research assistants, teaching assistants, or other graduate assistants will not receive any financial support from their department.
- 11) The pay during the leave period applies only to the portion of the period when the student is employed. For example, if a student is employed only until December 31st of a particular year and they start their leave on December 1st, they would receive pay only until December 31st of that year. However, if this student is actually employed until January 31st of the following year, they can be paid for a full 6-weeks across the Fall and Spring semesters.
- 12) Should the pregnant student need to modify their Program of Study, the student should refer to departmental policies for amendment procedures.
- 13) A leave longer than 6-weeks may be granted to accommodate for exceptional medical circumstances related to childbirth, but only the first six weeks will be covered by pay. Should such exceptional medical circumstances arise, students should seek a leave under the policies published in the University of Utah Student Handbook, <https://registrar.utah.edu/handbook/leave.php>.
- 14) This policy will be reviewed in July of 2022.

### 3. ACADEMIC CALENDAR

(Found at: <https://registrar.utah.edu/academic-calendars/archive/index.php>)

2020-2021 UNIVERSITY MAIN CAMPUS AND UONLINE PROGRAMS ACADEMIC CALENDAR			
GENERAL CALENDAR DATES	FALL SEMESTER 2020	SPRING SEMESTER 2021	SUMMER TERM 2021
Class schedule available	Monday, March 2	Monday, October 12	Monday, February 1
Registration dates available	Monday, March 2	Monday, October 12	Monday, February 22
Registration dates begin	Monday, April 13	Thursday, November 5	Monday, March 22
Deadline to apply for graduation	Friday, September 4	Friday, January 29	Wednesday, May 26
Open enrollment	Monday, July 27	Monday, November 30	Monday, April 12
House Bill 60 registration	Tuesday, August 18	Tuesday, January 12	Tuesday, May 11
Tuition payment due	Friday, September 4	Friday, January 29	Wednesday, May 26
Census deadline	Monday, September 14	Monday, February 8	Monday, June 7
University Commencement & Convocation Exercises	N/A	Thurs.-Fri., May 6-7	N/A
College of Law Graduation Exercises	N/A	Friday, May 14	N/A
Grades due	Monday, December 21	Monday, May 17	Monday, August 16
School of Dentistry Graduation Exercises	N/A	Friday, May 21	N/A
School of Medicine Graduation Exercises	N/A	Friday, May 21	N/A
<b>TERM LENGTH CLASSES</b>			
Classes begin**	Monday, August 24	Tuesday, January 19	Monday, May 17
Last day to add without a permission code	Friday, August 28	Friday, January 22	Friday, May 21
Last day to wait list	Friday, August 28	Friday, January 22	Friday, May 21
Last day to add, drop, audit	Friday, September 4	Friday, January 29	Wednesday, May 26
Last day to elect CR/NC	Friday, September 4	Friday, April 9**	Wednesday, May 26
Last day to withdraw from classes	Friday, October 16	Friday, March 12	Friday, June 25
Last day to reverse CR/NC option	Friday, November 27	Friday, April 23	Friday, July 30
Classes end	Thursday, December 3	Tuesday, April 27	Wednesday, Aug. 4
Reading Day	Friday, December 4	Wednesday, April 28	N/A
Final exam period	Mon.-Fri., Dec. 7-11	Thurs., Apr. 29-Wed., May 5	Thurs.-Fri., Aug. 5-6
<b>FIRST HALF CLASSES</b>			
Classes begin**	Monday, August 24	Tuesday, January 19	Monday, May 17
Last day to wait list	Friday, August 28	Friday, January 22	Thursday, May 20
Last day to add, drop, audit	Friday, August 28	Friday, January 22	Thursday, May 20
Last day to elect CR/NC	Friday, August 28	Friday, February 19**	Thursday, May 20
Last day to withdraw from classes	Friday, September 18	Friday, February 12	Friday, June 4
Last day to reverse CR/NC option	Friday, October 9	Friday, March 5	Friday, June 18
Classes end	Tuesday, October 13	Tuesday, March 9	Friday, June 25
<b>SECOND HALF CLASSES</b>			
Classes begin**	Wednesday, October 14	Wednesday, March 10	Monday, June 28
Last day to wait list	Tuesday, October 20	Monday, March 15	Thursday, July 1
Last day to add, drop, audit	Tuesday, October 20	Monday, March 15	Thursday, July 1
Last day to elect CR/NC	Tuesday, October 20	Friday, April 9**	Thursday, July 1
Last day to withdraw from classes	Friday, November 6	Friday, April 2	Friday, July 16
Last day to reverse CR/NC option	Friday, November 27	Friday, April 23	Friday, July 30
Classes end	Thursday, December 3	Tuesday, April 27	Wednesday, Aug. 4
<b>HOLIDAYS</b>			
Labor Day holiday	Monday, September 7		
Fall break*	Cancelled		
Thanksgiving break	Thurs.-Sun., Nov. 26-29		
Holiday recess	Sat., Dec 12-Mon., Jan 18		
Presidents Day		Monday, February 15	
Remote period for all classes		Mon.-Sun., March 1-14	
Non-Instructional Day		Friday, March 5	
Non-Instructional Day		Monday, April 5	
Spring break*		Cancelled	
Memorial Day holiday			Monday, May 31
Independence Day holiday (observed)			Monday, July 5
Pioneer Day holiday (observed)			Friday, July 23
<p>*Fall break changed from Oct. 11-18 to Oct. 4-11, cancelled due to COVID19. Spring Break scheduled for Mar. 7-14 is cancelled due to COVID19.</p> <p>**Start date for Spring regular session and 1st half changed from January 11 to January 19 and 2nd half from March 3 to March 10 due to COVID19. The elect CR/NC also changed for the Spring semester due to COVID 19.</p> <p>Calendar subject to change without notice. For the most up-to-date information, visit <a href="http://registrar.utah.edu/academic-calendars/index.php">http://registrar.utah.edu/academic-calendars/index.php</a></p>			

Last updated 7/16/2021

#### 4. COURSEWORK REQUIREMENTS BY DISCIPLINE

##### Water & Environmental

Core Courses		Even Spring	Even Fall	Odd Spring	Odd Fall
CVEEN 5410	Engineering Hydrology		X		X
CVEEN 5420	Open Channel Flow	X		X	
CVEEN 6430	Stormwater Management and Design				X
CVEEN 6440	Water Distribution Systems Design			X	
CVEEN 6470	Surface Water Quality Prediction and Assessment		X		
CVEEN 6480	Water Resources Planning and Management			X	
CVEEN 6600	Hazardous and Radioactive Waste Management	X			
CVEEN 6605	Water and Wastewater Treatment Design		X		X
CVEEN 6610#	Environmental Engineering Chemistry		X		X
CVEEN 6620	Environmental Processes	TBD			
CVEEN 6650#	Design of Biological Treatment Processes		X		
CVEEN 6555	Engineering Research and Seminar		X		X
CVEEN 6775	Environmental Regulations	TBD			
CVEEN 6920	Advanced Topics (in the area of water or environmental) *		X		
CVEEN 6930	Advanced Independent Study *	X	X	X	X
CVEEN 7410	Flood Modeling and Simulation	X			
CVEEN 7420	Groundwater Hydraulics	(Coming soon)			
CVEEN 7430	Advanced Subsurface Hydrologic Modeling	X			
CVEEN 7450	Carbon Sequestration Engineering and Science	(Coming soon)			
CVEEN 7460	Hydroinformatics		X		X
CVEEN 7620	Physical and Chem. Treatment Processes for Water Qual. Control	X			
CVEEN 7630		TBD			
CVEEN 7630	Field and Lab Methods for Environmental Practices	(Coming soon)			
CVEEN 7660	Water Reuse	X			
Elective courses listed next page.					

# Required of all students in the environmental area

\*CVEEN 6920, special topics courses that are not in the Water/ Environmental area will need to be petitioned to the student's supervisory committee to be counted towards the required core courses.



Approved Elective Courses		Even Spring	Even Fall	Odd Spring	Odd Fall
ATMOS 6040	Environmental Statistics			X	
ATMOS 6050	Environmental Instrumentation	X			
CH EN 6205	Smart Systems			X	
CH EN 6305	Air Pollution Control Engineering	X		X	
CH EN 6310	Concepts and Applications in Renewable Energy		X		
CH EN 6355	Computational Fluid Dynamics			X	
ECON 6250	Environmental and Natural Resource Economics				X
GEOG 5290	Water in Utah				
GEOG 6000	Advanced Geographical Data Analysis		X		X
GEOG 6110	Environmental Analysis Through Remote Sensing	X		X	
GEOG 6150	Spatial Database Design for GIS		X		X
GEOG 6180	Geoprocessing with Python		X		X
GEO 6350	Groundwater		X		X
GEO 6370	Environmental Contaminants		X		X
GEO 6385	Introduction to Groundwater Modeling	X		X	
GEO 6390	Solute Transport and Subsurface Remediation	X		X	
GEO 6650	Hydrology		X		X
LAW 7230	Water Law				X
LAW 7240	Environmental Law & Policy			X	X
ME EN 6740	Wind Energy				
ME EN 6750	Environmental Instrumentation	X			
ME EN 6800	Sustainable Energy		X		X
ME EN 7710	Environmental Fluid Dynamics				
POLS 6870	Environmental Justice				
SOC6840	Environmental Sociology	X			
<p>Any CVEEN 6xxx or 7xxx course approved by the student's supervisory committee.</p> <p>Appropriate courses not listed may be approved for elective credit by the student's supervisory committee.</p> <p>Please note, for CVEEN 6930: Independent Study, the proposal must be submitted to the Graduate Committee Four+ weeks prior to the start of the intended term of enrollment. The faculty responsible for overseeing the independent study may not be the student's committee chair.</p>					

## Transportation & Materials

Core Courses	
CVEEN 6510	Highway Design
CVEEN 6530	Quantitative Methods in Transportation Operation
CVEEN 6560*	Transportation Planning
CVEEN 6570	Pavement Design
CVEEN 6920	Optimization in Transportation
CVEEN 7545	Transportation Infrastructure Maintenance
CVEEN 7550	Advanced Construction Materials
CVEEN 7920	Advanced Topics (In Transportation)

\* Required of all transportation students.

Elective Courses	
CS 6140	Data Mining
GS 6350	Machine Learning
GEOG 6160	Spatial Modeling in GIS
GEOG 6180	Geoprocessing with Python
Note: Any CVEEN 6xxx or 7xxx can be approved by the supervisory committee as electives. Additionally, relevant courses in other departments not listed here can be approved by the student's supervisory committee for elective credit.	

## Structures & Geotechnical

Core Courses		
As part of the 15 CORE Credits, structural and geotechnical students should take at least one course from each one of the following areas.		
* Structures Area		* The requirement can be partially or fully waived if the student passed at least one of the courses (or equivalent) in undergraduate studies. The waiver will not reduce the minimum credit course requirements for the MS degree.
CVEEN 6210	Structural Analysis II	
CVEEN 6220	Concrete Design II	
CVEEN 6230	Steel Design II	
CVEEN 6250	Structural Dynamics	
* Geotechnical Area		
CVEEN 5305	Intro. to Foundation Eng.	
CVEEN 6310	Foundation Engineering	
CVEEN 6330	Soil Dynamics	
CVEEN 6350	Soil Improvement and Stabilization	
CVEEN 6920	Numerical Methods in Geotech. Eng.	
CVEEN 5305	Intro to Foundation Eng.	
CVEEN 6210	Structural Analysis II	
CVEEN 6220	Concrete Design II	
CVEEN 6225	Concrete Science	
CVEEN 6230	Steel Design II	
CVEEN 6240	Masonry/ Timber Design	
CVEEN 6250	Structural Dynamics	
CVEEN 6270	Computer- Aided Structural Analysis	
CVEEN 6310	Foundation Engineering	
CVEEN 6330	Soil Dynamics	
CVEEN 6340	Advanced Geotechnical Testing	
CVEEN 6350	Soil Improvement and Stabilization	
CVEEN 6510	Highway Design	
CVEEN6525	Highway and Traffic Engineering	
CVEEN 6570	Pavement Design	
CVEEN 6790	Advanced Computer Aided Construction	
CVEEN 7225	Prestressed Concrete Design	
CVEEN 7230	Topics in Steel Design	
CVEEN 7235	Bridge Design	
CVEEN 7250	Structural Earthquake Engineering	
CVEEN 7255	Advanced Dynamics of Structures	
CVEEN 7310	Advanced Foundation Engineering	
CVEEN 7330	Geotechnical Earthquake Engineering	
CVEEN 7360	Advanced Soil Mechanics	
CVEEN 7450	Carbon Capture and Store Transportation	
CVEEN 7520	Safety	
CVEEN 7560	Advanced Materials	
CVEEN 7570	Pavement Maintenance and Rehabilitation	

Structures & Geotechnical (Continued).

Elective Courses			
Only 9 credits outside of the Department may be used towards a master's degree. Other courses may be approved by Supervisory Committee.			
CVEEN 5305	Intro. to Foundation Engineering	ME EN 6300	Advanced Strengths of Materials
CVEEN 6225	Concrete Material Science	ME EN 6400	Vibrations
CVEEN 6235	Bridge Design	ME EN 6510	Introduction to Finite Elements
CVEEN 6260	Applied Probability and Statistics	ME EN 6520	Mechanics of Composite Materials
CVEEN 6320	Waste Containment Systems	ME EN 7060	Fatigue and Creep Considerations in Design
CVEEN 6350	Soil Improvement and Stabilization	ME EN 7070	Tribology and Corrosion Considerations in Design
CVEEN 6710	Cost Estimating and Proposal Writing	ME EN 7530	Fundamentals of Fracture Mechanics
CVEEN 6720	Project Scheduling	ME EN 7540	Advanced Finite Elements
CVEEN 6730	Project Mgmt and Contract Admin.	ME EN 7550	Theory of Plates and Shells
CVEEN 6750	Engineering Law and Contracts	MET E 6100	Micromechanisms of Fatigue and Fracture
CVEEN 6920	Special Topics (in Materials, Structures, Geotechnics only)	MET E 6250	Fundamentals of Engineering Analysis
CVEEN 6930	Independent Study	MET E 6300	Alloy and Material Design
CVEEN 7260	Seismic Rehab of Reinforced Concrete Bldg.	MET E 6450	Mechanical Metallurgy
CVEEN 7920	Special Topics (in Materials, Structures, Adv. Materials Testing Geotechnics only)	MET E 6600	Corrosion Fundamentals & Minimization
CVEEN 7930	Adv. Independent Study	MG EN 5150	Mechanics of Materials
CS 5600	Intro. to Computer Graphics	MG EN 5270	Landslides and Slope Stability
CS 6300	Artificial Intelligence	MG EN 5290	Introduction to Finite Element Modeling in Geomechanics
CS 6610	Interactive Computer Graphics	MSE 5032	Thermodynamics of Solids
GEO 5075	Intro. to Geological Engineering	MSE 5475	Introduction to Composites
GEO 5150	Geological Engineering Design	MSE 6001	Engineering Materials
GEO 5200	Depositional Environments		
GEO 5210	Seismology I: Tectonophysics and Elastic Waves		
GEO 5220	Seismology II: Exploration and Engineering Seismology		
GEO 5320	Signal and Image Processing in the Geosciences		
GEO 6160	Clay Mineral Geochemistry		
GEO 6260	Petrophysics and Well-Logging		
GEO 6330	Earthquake Seismology and Risk Assessment		
GEO 6350	Groundwater		
GEO 6360	Fluid Dynamics of Earth Materials		
GEO 6370	Contaminant Partitional for Engineering and Scientists		
GEO 6660	Geochemistry		
MATH 6420	Partial Differential Equations		
MATH 6610	Analysis of Numerical Methods I		
MATH 6620	Analysis of Numerical Methods II		

## Nuclear

### Master's-Level Requirements:

- Graduate credit hours are listed as 5000 and above.
- Students can include no more than 9 credit hours of graduate level non-matriculated coursework, taken within 3 years of credit hour approval, with a final grade of B or better.
- Students can apply no more than 6 credit hours of graduate level coursework from another institution, with a final grade of B or better. This credit may not have counted towards the completion of a prior degree.
- Up to 3 credits of independent research, taken as NUCL 6900 or 7900.
- Up to 12 credits of electives offered by other departments in engineering, science, and math-related disciplines that complement the student's research. Elective courses may be taken in any science, engineering, technology discipline that supports your research.

MS students must complete a minimum of 30 hours of graduate level coursework.	
Required Courses.	Choose a minimum of FOUR additional electives from the list below.
NUCL 6030: Graduate Radiation Interactions (3 cr.) NUCL 6050: Reactor Physics (3 cr.)	NUCL 5060: Reactor Operation and Regulatory Policy (3 cr.) NUCL 6032: Graduate Radiochemistry (3 cr.) NUCL 7110: Nuclear Environmental Engineering (3 cr.) NUCL 7220: Analytical Nuclear Forensics (3 cr.) NUCL 7000: Health Physics (3 cr.) NUCL 7500: Nuclear Safeguards (3 cr.) NUCL 7100: Nuclear Instrumentation (4 cr.) MET E 6210: Nuclear Materials (3 cr.) CVEEN 6120: Numerical Methods (3 cr.)

### Doctoral – Level Requirements:

- Graduate credit hours are listed as 5000 and above.
- Students can include no more than 9 credit hours of graduate level non-matriculated coursework, taken within 3 years of credit hour approval, with a final grade of B or better.
- Students can apply no more than 6 credit hours of graduate level coursework from another institution, with a final grade of B or better. This credit may not have counted towards the completion of a prior degree.
- Up to 3 credits of independent research, taken as NUCL 6900 or 7900.
- Up to 12 credits of electives offered by other departments in engineering, science, and math-related disciplines that complement the student's research. Elective courses may be taken in any science, engineering, technology discipline that supports your research.

### Required Courses. (These NUCL courses serve as the basis of the qualifying exam.)

- ☐ CVEEN 6555: Research and Seminar (3 cr.) – All students starting Fall 2020 and after.
- ☐ NUCL 6030: Graduate Radiation Interactions (3 cr.)
- ☐ NUCL 6050: Reactor Physics (3 cr.)
- ☐ NUCL 7000: Health Physics (3 cr.)
- ☐ NUCL 7100: Nuclear Instrumentation (4 cr.)

### Choose a minimum of two additional NUCL electives from the list below.

- ☐ NUCL 6032: Graduate Radiochemistry (3 cr.)
- ☐ NUCL 6060: Reactor Operation and Regulatory Policy (3 cr.)

- ☐ NUCL 7110: Nuclear Environmental Engineering (3 cr.)
- ☐ NUCL 7220: Analytical Nuclear Forensics (3 cr.)
- ☐ NUCL 7500: Nuclear Safeguards (3 cr.)
- ☐ MET E 6210: Nuclear Materials (3 cr.)
- ☐ CVEEN 6120: Numerical Methods (3 cr.)

Credit Hour Requirements		
	Coursework	Research
<b>MS to PhD</b>	Minimum of 18 credits	Minimum of 14 credits
<b>Direct Admit (no MS)</b>	Minimum of 30 credits	Minimum of 14 credits