From:	Smith, Randy
To:	Coifman, Benjamin
Cc:	Sutherland, Sue; Reed, Katie; Smith, Randy; Miriti, Maria; Greenbaum, Rob; Duffy, Lisa; Hunt, Ryan; MacKay, Allison; Quinzon-Bonello, Rosario; Tomasko, David; Fierce, Jacquelyn
Subject:	Proposal to revise the PhD in Civil Engineering
Date:	Thursday, January 23, 2025 2:01:05 PM
Attachments:	image001.png

Benn,

The proposal from the Department of Civil, Environmental, and Geodetic Engineering to revise the PhD in Civil Engineering was approved by the Council on Academic Affairs at its meeting on January 22, 2025. Thank you for attending the meeting to respond to questions/comments.

No additional level of internal review/approval is necessary. This action will be included in the Council's next Annual Activities Report to the University Senate (July 2025).

The Office of the University Registrar will work you with any implementation issues.

Please keep a copy of this message for your file on the proposal and I will do the same for the file in the Office of Academic Affairs.

If you have any questions please contact the Chair of the Council, Professor Sue Sutherland (.43), or me.

I wish you success with this important program development.

Randy

THE OHIO STATE UNIVERSITY

W. Randy Smith, Ph.D.
Vice Provost for Academic Programs
Office of Academic Affairs
University Square South, 15 E. 15th Avenue, Columbus, OH 43201
614-292-5881 Office
smith.70@osu.edu
Assisted by:
Katie Reed
Executive Assistant
(614) 292-5672

TO: Randy Smith, Vice Provost for Academic Programs

FROM: Graduate School Curriculum Services

DATE: **12/04/2024**

RE: Proposal to **Revise the PhD Civil Engineering** in **The College of Engineering**

The **Department of Civil Engineering** in the **College of Engineering** is proposing a **Revision to the PhD in Civil Engineering**.

The proposal was received by the Graduate School on **11/07/2024**. The combined GS/CAA subcommittee first reviewed the proposal on **11/21/2024** and was returned for revisions. The revisions were received on **11/27/2024.** It is supported for review by the Council on Academic Affairs.

THE OHIO STATE UNIVERSITY

College of Engineering

Department of Civil, Enrivonmental and
Geodetic Engineering

470 Hitchcock Hall
2070 Neil Avenue
Columbus, OH 43210

(614) 292-2771 Phone

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September 17, 2024

To: College Committee for Academic Affairs
Re: CIVENG-PH Curriculum Update Proposal

The Civil, Environmental and Geodetic Engineering (CEGE) department recently completed a multi-year effort to revise our graduate programs, including updates to both curricular requirements and co-curricular activities. We seek approval for the proposed curricular revisions to be effective starting **Autumn 2025** when the revisions to co-curricular activities outlined in our program's newly approved graduate studies handbook will also go into effect.

Summary of Proposed Curricular Changes to CIVENG-PH:

Previous requirements:	Proposed requirements:
Graded course options: • Table A coursework (12 credits) • Table B coursework (8 credits)	Graded course options: • CEGE Depth coursework (6 credits) • CEGE Breadth coursework (3 credits) • Cross-Disciplinary coursework (3 credits) • Data Analysis coursework (3 credits)
	Newly required courses: • CEGE Seminar (4 credits) • Writing requirement (3 credits)
Unchanged: • Dissertation Research (30 credits) • Master's Degree transfer - optional (block of 30 credits possible) • Electives (Balance required to achieve total of 80 credits)	Unchanged: • Dissertation Research (30 credits) • Master's Degree transfer - optional (block of 30 credits possible) • Electives (Balance required to achieve total of 80 credits)

The newly proposed curriculum consists of changes in two major areas. The first change is to how graded course options are communicated to students. The previous curriculum required courses to be selected from 'Table A' and 'Table B', but this categorization failed to provide insight into why courses may be grouped into either of these tables. The newly proposed curricular requirements more clearly articulate the spirit of the requirement while providing flexibility for students to select courses in consultation with their advisory committee that best support their academic goals. Courses that were formerly counted in 'Table A' and 'Table B' requirements will be distributed across the updated graded course options of:

- **CEGE Depth** – CIVILEN/ENVENG letter graded graduate courses directly supporting a deeper understanding within the student's research focus area.
- **CEGE Breadth** - CIVILEN/ENVENG letter graded graduate courses connecting the research focus within a broader context of other disciplines/specializations.
- **Cross-Disciplinary** – letter graded graduate course(s) offered outside of CIVILEN/ENVENG
- **Data Analysis** – suggested list of courses that best align with the department's data analysis proficiency expectations outline in the new handbook

The second change is the addition of two newly required existing courses. Students will meet the **Seminar** requirement by taking our existing 1 credit hour course CIVILEN 6880 Civil Engineering Graduate Seminar for the first 4 semesters of enrollment in the program. The seminar course is intended to support skill development aligned with proficiencies students are expected to meet during their time in our graduate program. Requiring incoming students to register for the seminar course provides a structured environment to support student success. Students will meet the **Writing** requirement by taking ENGR 7710 Engineering Research Communications. Similar to the seminar requirement, the writing requirement is intended to prepare students for the writing tasks specific to the graduate experience and beyond.

We calculate the percentage of change to our degree requirements to be 27.5%. Of the 80 credit degree, this proposal includes changes to 22 credits: 15 credits of course options (6 credits Depth, 3 credits Breadth, 3 credits Cross-Disciplinary, 3 credits Data Analysis) and 7 credits of newly required courses (4 credits Seminar, 3 credits Writing).

Students joining the program on or after the effective start date will proceed with the new curriculum. The transition plan for students currently enrolled in CIVENG-PH is to meet with their advisory committee to determine if the student selects to a) continue under the previous curriculum or b) transition to the new curriculum. The option to continue with the previous curriculum protects against the possibility that a student might otherwise be required to take

many additional courses.

Current students who select to transition to the new curriculum will work with their advisory committees to map their previously completed courses to the newly approved curriculum. This transition will not add time to degree. The following addresses specific curricular elements for these students,

Table A, Table B -> Depth, Breadth, Cross-Disciplinary, and Data Analysis:

Mapping coursework completed under the former curriculum to the new requirements is facilitated by the fact that existing 'Table A' and 'Table' B courses satisfy the newly defined categories of Depth, Breadth, Cross-Disciplinary, and Data Analysis.

New Seminar Requirement:

For students who opt in to the new curriculum, those who have been enrolled in this degree for longer than 4 semesters will not be required to meet the new seminar requirement (as this course is designed to address skills and milestones in the first 2 years of the degree). Students who have been enrolled for 2 semesters will complete 2 semesters of the seminar course, and those enrolled for 1 semester will complete 3 semesters. Credits waived based on this transition plan will become elective credits to meet the balance required for the degree.

New Writing Requirement:

The Writing requirement will be waived for students who are post-candidacy in Autumn 2025. All other current students who select the new curriculum will be required to take ENGR 7710. Credits waived based on this transition plan will become elective credits to meet the balance required for the degree.

Sincerely,

Benjamin Coifman

Professor Benjamin Coifman

Graduate Studies Chair

Civil, Environmental and Geodetic Engineering

CIVENG-PH Current

Doctor of Philosophy (PhD) in Civil Engineering, Degree Requirements across tracks/specialization

Table A (select at least 12 hours)

Course number	Course Title	Credits
Varies by track	Varies by track	varies
Varies by track	Varies by track	varies
Varies by track	Varies by track	varies
Varies by track	Varies by track	varies

Table B (select at least 8 hours, can also include excess credits from Table A courses)

Course number	Course Title	Credits
Varies by track	Varies by track	varies
Varies by track	Varies by track	varies
Varies by track	Varies by track	varies

Dissertation Research (at least 30 credits)

Course number	Course Title	Credits
CIVILEN 8999	Civil Engineering Research for Dissertation	1-15

Master's Degree Transfer (option for block of 30 credits)

Course number	Course Title	Credits
CIVILEN SPL	Special (transfer credit posted by Graduate School)	30

Electives (balance required to achieve total of 80 credits)

Coursework can be selected from Table A, Table B, Dissertation Research hours, graduate level coursework at OSU approved by faculty advisor, and/or up to 3 credits of CIVILEN 8193.

CIVENG-PH Markup

Doctor of Philosophy (PhD) in Civil Engineering, Degree Requirements across tracks/specialization

Table A (select at least 12 hours) and **Table B** (select at least 8 hours) courses move to:
CEGE Depth (6), **CEGE Breadth** (3), **Cross-Disciplinary** (3), and **Data Analysis** (3)
Resulting change: 20 hours of coursework options → 15 hours of options + 7 newly required

CEGE Depth Coursework (select at least 6 credits)
5000 level+ letter graded graduate courses selected in consultation with the advisory committee, directly supporting a deeper understanding within the student's research focus area. Guideline for course selection to include courses from former Table A and Table B.

Course number	Course Title	Credits

CEGE Breadth Coursework (select at least 3 credits)
5000 level+ letter graded graduate course(s) selected in consultation with the advisory committee, connecting the research focus within a broader context of other disciplines/specializations. Guideline for course selection to include courses from former Table A and Table B.

Course number	Course Title	Credits

Cross-Disciplinary Coursework (select at least 3 credits)
5000 level+ letter graded graduate course(s) offered outside of the Department of Civil, Environmental and Geodetic Engineering selected in consultation with the advisory committee. Guideline for course selection to include courses from former Table A and Table B.

Course number	Course Title	Credits

Data Analysis Coursework (select at least 3 credits)
Select from the following, or 5000 level+ letter graded graduate course approved by advisory committee. Guideline for course selection to include courses from former Table A and Table B.

Course number	Course Title	Credits
CIVILEN 7421	Adv. Machine Learning, Remote Sensing Image Interpret.	3
ENVENG 6220	Data Analysis in Environmental Engineering	3
STAT 5301	Intermediate Data Analysis I	4

CEGE Seminar (4 credits)

Course number	Course Title	Credits
CIVILEN 6880	Civil Engineering Graduate Seminar	1 (x4)

Writing (3 credits)

Course number	Course Title	Credits
ENGR 7710	Engineering Research Communications	3

Dissertation Research (at least 30 credits)

Course number	Course Title	Credits
CIVILEN 8999	Civil Engineering Research for Dissertation	1-15/sem.

Master's Degree Transfer (option for block of 30 credits)

Course number	Course Title	Credits
CIVILEN SPL	Special (transfer credit posted by Graduate School)	30

Electives (balance required to achieve total of 80 credits)

Coursework can be selected from ~~Table A, Table B,~~ Depth, Breadth, Cross-disciplinary, Data Analysis, Dissertation Research hours, graduate level coursework at OSU approved by faculty advisor and student's committee, and/or up to 3 credits of CIVILEN 8193.

CIVENG-PH Proposed

Doctor of Philosophy (PhD) in Civil Engineering, Degree Requirements across tracks/specialization

CEGE Depth Coursework (select at least 6 credits)
CIVILEN/ENVENG letter graded graduate courses selected in consultation with the advisory committee, directly supporting a deeper understanding within the student's research focus area.

Course number	Course Title	Credits

CEGE Breadth Coursework (select at least 3 credits)
CIVILEN/ENVENG letter graded graduate courses selected in consultation with the advisory committee, connecting the research focus within a broader context of other disciplines/specializations.

Course number	Course Title	Credits

Cross-Disciplinary Coursework (select at least 3 credits)
5000 level+ letter graded graduate course(s) offered outside of CIVILEN/ENVENG selected in consultation with the advisory committee.

Course number	Course Title	Credits

Data Analysis Coursework (select at least 3 credits)
Select from the following, or 5000 level+ letter graded graduate course approved by advisory committee.

Course number	Course Title	Credits
CIVILEN 7421	Adv. Machine Learning, Remote Sensing Image Interpret.	3
ENVENG 6220	Data Analysis in Environmental Engineering	3
STAT 5301	Intermediate Data Analysis I	4

CEGE Seminar (4 credits)
Enroll in the CEGE Graduate Seminar for 1 credit for each of the first 4 semesters in the program.

Course number	Course Title	Credits
CIVILEN 6880	Civil Engineering Graduate Seminar	1 (x4)

Writing (3 credits)

Course number	Course Title	Credits
ENGR 7710	Engineering Research Communications	3

Dissertation Research (at least 30 credits)

Course number	Course Title	Credits
CIVILEN 8999	Civil Engineering Research for Dissertation	1-15/sem.

Master's Degree Transfer (option for block of 30 credits)

Course number	Course Title	Credits
CIVILEN SPL	Special (transfer credit posted by Graduate School)	30

Electives (balance required to achieve total of 80 credits)

Coursework can be selected from Depth, Breadth, Cross-Disciplinary, Data Analysis, Dissertation Research, graded graduate level coursework approved by advisory committee, and/or up to 3 credits of CIVILEN 8193.

Note: A course that conceptually meets the requirement for more than one curricular area can be used to satisfy one requirement or the other, but not both.

CIVENG-PH ENV Current

Doctor of Philosophy (PhD) in Civil Engineering, Environmental Engineering graduate track/specialization

Table A (select at least 12 hours)

Course number	Course Title	Credits
CIVILEN 5001	Introduction to Geographic Information Systems	4
CIVILEN 5130	Applied Hydrology	3
CIVILEN/Math 5168	Introduction to the Finite Element Method	3
CIVILEN 5220	Open Channel Hydraulics	3
CIVILEN 5230	Transport Phenomena in Water Resources Engineering	3
CIVILEN 6210	Physics of Sustainable Buildings	3
CIVILEN 6220	Water Resources Systems Analysis	3
ENVENG 5110	Environmental Engineering Bioprocesses	3
ENVENG 6218	Measurement & Modeling of Climate Change	3
ENVENG 5120	Bioremediation of Soil and Groundwater	3
ENVENG 5170	Sustainability & Pollution Prevention Practices	3
ENVENG 5195	Engineering Design for Environmental Health	3
ENVENG 5210	Advanced Physical Chemical Treatment Processes	3
FABENG 5310	Ecological Engineering and Science	3
ENVENG 5760	Design of Urban Stormwater Control Measures	3
FABENG 5820	Environmental Controls and Air Quality	3
ENVENG 5850	Advanced Topics in Environmental Engineering	1
CIVILEN 5880	Civil Engineering Departmental Seminar	1
ENVENG 6100	Environmental Engineering Analytical Methods	3
ENVENG 6200	Fundamentals of Environmental Engineering	3
ENVENG 6210	Environmental Engineering Unit Operations	3
CIVILEN 6211	Simulation of Building Energy Performance	3
ENVENG 6220	Data Analysis in Environmental Engineering	3
CIVILEN 6230	Numerical Models in Water Resources Engineering	3
CIVILEN 6240	Water Resources Systems Analysis	3
ENVENG 6400	Integrated Environmental Chemical Fate and Transport	3
ENVENG 7220	Colloidal and Interfacial Processes in Aquatic Systems	3
CIVILEN 7453	Photogrammetric Computer Vision	3

Table B (select at least 8 hours, can also include excess credits from Table A courses)

Course number	Course Title	Credits
CBE 5771	Air Pollution	3
CBE 5772	Principles of Sustainable Engineering	3
CBE 5779	Design and Analysis of Experiments	3
CHEM 4300	Physical Chemistry I	3
CHEM 4310	Physical Chemistry II	3
CHEM 6530	Kinetics	1.5
CHEM 6550	Atmospheric Chemistry	3
EARTHSC/MICRBIO 5160	Geomicrobiology	3

EARTHSC 5651	Hydrogeology	4
EARTHSC 5718	Aquatic Geochemistry	3
EARTHSC 5719	Environmental Organic Geochemistry	3
EARTHSC 5751	Quantitative Reservoir Modeling	4
ECE 5042/5043	Power Systems	3
ECE 6541	Advanced Topics in Sustainable Energy and Power Sys.	3
EEOB 5420	Aquatic Ecosystems – Ecology of Inland Waters	1.5 - 4.0
EEOB 6210	Ecotoxicology	2 - 4
ENVENG/PUBAFRS 5600	Science, Engineering, and Public Policy	3
ENVENG/ISE/FABE 6020	Fundamentals of Data-Driven Energy Systems	3
ENVENG 6610	Analytic Frameworks for Science, Eng. And Policy	3
ENGR 7710	Engineering Research and Communication	3
ENR 5262	Soil Chemical Processes and Environmental Quality	3
ENR 5273	Env. Fate and Impact of Contaminants in Soil & Water	3
ENR 5274	Ecosystems Simulation	2
ENR 7520	Environmental Science and Law	3
LAW 8310	Energy Law	3
FABENG 5310	Ecological Engineering and Science	3
MECHENG 4510	Heat Transfer	3
MECHENG 5372	Theory and Applications of Feedback Control	3
MECHENG 5541	Heating, Ventilating, and Air Conditioning	3
MECHENG 6510	Intermediate Heat Transfer	3
MICRBIO 4000	Basic and Practical Microbiology	4
MICRBIO 4100	General Microbiology	5
MICRBIO 5155	Environmental Microbiology	3
STAT 5301	Intermediate Data Analysis I	4

Dissertation Research (at least 30 credits)

Course number	**Course Title**	**Credits**
CIVILEN/ENVENG 8999	Civil Engineering Research for Dissertation	1-15

Master's Degree Transfer (option for block of 30 credits)

Course number	**Course Title**	**Credits**
CIVILEN SPL	Special (transfer credit posted by Graduate School)	30

Electives (balance required to achieve total of 80 credits)

Coursework can be selected from Table A, Table B, Dissertation Research hours, graduate level coursework at OSU approved by faculty advisor, and/or up to 3 credits of CIVILEN/ENVENG 8193.

CIVENG-PH ENV Markup

Doctor of Philosophy (PhD) in Civil Engineering, Environmental Engineering graduate track/specialization

Table A (select at least 12 hours) and **Table B** (select at least 8 hours) courses move to:
CEGE Depth (6), **CEGE Breadth** (3), **Cross-Disciplinary** (3), and **Data Analysis** (3)
Resulting change: 20 hours of coursework options → 15 hours of options + 7 newly required

CEGE Depth Coursework (select at least 6 credits)
5000 level+ letter graded graduate courses selected in consultation with the advisory committee, directly supporting a deeper understanding within the student's research focus area. Guideline for course selection to include courses from former Table A and Table B.

Course number	Course Title	Credits
CIVILEN 5130	Applied Hydrology	3
CIVILEN 5220	Open Channel Hydraulics	3
CIVILEN 5230	Transport Phenomena in Water Resources Engineering	3
ENVENG 5110	Environmental Engineering Bioprocesses	3
ENVENG 6218	Measurement & Modeling of Climate Change	3
ENVENG 5120	Bioremediation of Soil and Groundwater	3
ENVENG 5170	Sustainability & Pollution Prevention Practices	3
ENVENG 5195	Engineering Design for Environmental Health	3
ENVENG 5210	Advanced Physical Chemical Treatment Processes	3
ENVENG 5760	Design of Urban Stormwater Control Measures	3
ENVENG 5850	Advanced Topics in Environmental Engineering	1
ENVENG 6100	Environmental Engineering Analytical Methods	3
ENVENG 6200	Fundamentals of Environmental Engineering	3
ENVENG 6210	Environmental Engineering Unit Operations	3
CIVILEN 6211	Simulation of Building Energy Performance	3
ENVENG 6400	Integrated Environmental Chemical Fate and Transport	3
ENVENG 7220	Colloidal and Interfacial Processes in Aquatic Systems	3

CEGE Breadth Coursework (select at least 3 credits)
5000 level+ letter graded graduate course(s) selected in consultation with the advisory committee, connecting the research focus within a broader context of other disciplines/specializations. Guideline for course selection to include courses from former Table A and Table B.

Course number	Course Title	Credits
CIVILEN 5001	Introduction to Geographic Information Systems	4
CIVILEN 6210	Physics of Sustainable Buildings	3
CIVILEN 7453	Photogrammetric Computer Vision	3

Cross-Disciplinary Coursework (select at least 3 credits)
5000 level+ letter graded graduate course(s) offered outside of the Department of Civil, Environmental and Geodetic Engineering selected in consultation with the advisory committee. Guideline for course selection to include courses from former Table A and Table B.

Course number	Course Title	Credits
FABENG 5310	Ecological Engineering and Science	3
FABENG 5820	Environmental Controls and Air Quality	3
CBE 5771	Air Pollution	3
CBE 5772	Principles of Sustainable Engineering	3
CBE 5779	Design and Analysis of Experiments	3
CHEM 4300	Physical Chemistry I	3
CHEM 4310	Physical Chemistry II	3
CHEM 6530	Kinetics	1.5
CHEM 6550	Atmospheric Chemistry	3
EARTHSC/MICRBIO 5160	Geomicrobiology	3
EARTHSC 5651	Hydrogeology	4
EARTHSC 5718	Aquatic Geochemistry	3
EARTHSC 5719	Environmental Organic Geochemistry	3
EARTHSC 5751	Quantitative Reservoir Modeling	4
ECE 5042/5043	Power Systems	3
ECE 6541	Advanced Topics in Sustainable Energy and Power Sys.	3
EEOB 5420	Aquatic Ecosystems – Ecology of Inland Waters	1.5 - 4.0
EEOB 6210	Ecotoxicology	2 - 4
ENVENG/PUBAFRS 5600	Science, Engineering, and Public Policy	3
ENVENG/ISE/FABE 6020	Fundamentals of Data-Driven Energy Systems	3
ENVENG 6610	Analytic Frameworks for Science, Eng. And Policy	3
ENGR 7710	Engineering Research and Communication	3
ENR 5262	Soil Chemical Processes and Environmental Quality	3
ENR 5273	Env. Fate and Impact of Contaminants in Soil & Water	3
ENR 5274	Ecosystems Simulation	2
ENR 7520	Environmental Science and Law	3
LAW 8310	Energy Law	3
FABENG 5310	Ecological Engineering and Science	3
MECHENG 4510	Heat Transfer	3
MECHENG 5372	Theory and Applications of Feedback Control	3
MECHENG 5541	Heating, Ventilating, and Air Conditioning	3
MECHENG 6510	Intermediate Heat Transfer	3
MICRBIO 4000	Basic and Practical Microbiology	4
MICRBIO 4100	General Microbiology	5

Data Analysis Coursework (select at least 3 credits)

Select from the following, or 5000 level+ letter graded graduate course approved by advisory committee. Guideline for course selection to include courses from former Table A and Table B.

Course number	Course Title	Credits
CIVILEN 7421	Adv. Machine Learning, Remote Sensing Image Interpret.	3
ENVENG 6220	Data Analysis in Environmental Engineering	3
STAT 5301	Intermediate Data Analysis I	4

CEGE Seminar (4 credits)

Course number	Course Title	Credits
CIVILEN 6880	Civil Engineering Graduate Seminar	1 (x4)

Writing (3 credits)

Course number	Course Title	Credits
ENGR 7710	Engineering Research Communications	3

Dissertation Research (at least 30 credits)

Course number	Course Title	Credits
CIVILEN 8999	Civil Engineering Research for Dissertation	1-15/sem.

Master's Degree Transfer (option for block of 30 credits)

Course number	Course Title	Credits
CIVILEN SPL	Special (transfer credit posted by Graduate School)	30

Electives (balance required to achieve total of 80 credits)

Coursework can be selected from ~~Table A, Table B,~~ Depth, Breadth, Cross-disciplinary, Data Analysis, Dissertation Research hours, graduate level coursework at OSU approved by faculty advisor and student's committee, and/or up to 3 credits of CIVILEN 8193.

CIVENG-PH ENV Proposed

Doctor of Philosophy (PhD) in Civil Engineering, Environmental Engineering track/specialization

CEGE Depth Coursework (select at least 6 credits)
CIVILEN/ENVENG letter graded graduate courses selected in consultation with the advisory committee, directly supporting a deeper understanding within the student's research focus area.

Course number	Course Title	Credits

CEGE Breadth Coursework (select at least 3 credits)
CIVILEN/ENVENG letter graded graduate courses selected in consultation with the advisory committee, connecting the research focus within a broader context of other disciplines/specializations.

Course number	Course Title	Credits

Cross-Disciplinary Coursework (select at least 3 credits)
5000 level+ letter graded graduate course(s) offered outside of CIVILEN/ENVENG selected in consultation with the advisory committee.

Course number	Course Title	Credits

Data Analysis Coursework (select at least 3 credits)
Select from the following, or 5000 level+ letter graded graduate course approved by advisory committee.

Course number	Course Title	Credits
CIVILEN 7421	Adv. Machine Learning, Remote Sensing Image Interpret.	3
ENVENG 6220	Data Analysis in Environmental Engineering	3
STAT 5301	Intermediate Data Analysis I	4

CEGE Seminar (4 credits)
Enroll in the CEGE Graduate Seminar for 1 credit for each of the first 4 semesters in the program.

Course number	Course Title	Credits
CIVILEN 6880	Civil Engineering Graduate Seminar	1 (x4)

Writing (3 credits)

Course number	Course Title	Credits
ENGR 7710	Engineering Research Communications	3

Dissertation Research (at least 30 credits)

Course number	Course Title	Credits
CIVILEN 8999	Civil Engineering Research for Dissertation	1-15/sem.

Master's Degree Transfer (option for block of 30 credits)

Course number	Course Title	Credits
CIVILEN SPL	Special (transfer credit posted by Graduate School)	30

Electives (balance required to achieve total of 80 credits)

Coursework can be selected from Depth, Breadth, Cross-Disciplinary, Data Analysis, Dissertation Research, graded graduate level coursework approved by advisory committee, and/or up to 3 credits of CIVILEN 8193.

Note: A course that conceptually meets the requirement for more than one curricular area can be used to satisfy one requirement or the other, but not both.

CIVENG-PH GEO Current

Doctor of Philosophy (PhD) in Civil Engineering, Geoinformation and Geodetic Engineering track

Table A (select at least 12 hours)

Course number	Course Title	Credits
CIVILEN 5001	Introduction to Geographic Information Systems	4
CIVILEN 5420	Remote Sensing of Environment	3
CIVILEN 5421	Spatial Analysis Techniques for Civil Engineering	3
CIVILEN 5441	Introduction to GPS: theory and applications	3
CIVILEN 5461	Geospatial Numerical Analysis	4
CIVILEN 6431	GIS and Cartographic Engineering	4
CIVILEN 6435	Global Navigation Satellite Systems (GNSS) Data Processing	3
CIVILEN 6451	Introduction to photogrammetry	4
CIVILEN 7421	Advanced Remote Sensing and Machine Learning	3
CIVILEN 7432	Advanced spatial data structures and databases	4
CIVILEN 7433	GIS Analysis and projects	3
CIVILEN 7442	Fundamentals of GPS and Reference Systems	4
CIVILEN 7452	Spatial Geometry and Spectral Analysis	4
CIVILEN 7453	Photogrammetric computer vision	3
CIVILEN 7461	Advanced geospatial numerical analysis	3
CIVILEN 8420	Radiometric measurements and modeling	3
CIVILEN 8421	Integrating Remote Sensing with Engineering Databases	3
CIVILEN 8434	Advanced planetary mapping and exploration	3
CIVILEN 8443	Advanced topics in GPS	3
CIVILEN 8454	Videogrammetry	3
CIVILEN 8462	Advanced geospatial sensors and methods	3
GEOSCIM 5637	Topics in Mapping	3
GEOSCIM 5652	Adjustment Computations	5
GEOSCIM 6786	Geospatial Data Structures for Computer Mapping and GIS	3
GEOSCIM 7745	Inertial Navigation/Positioning Analysis	4
GEOSCIM 7765	Analysis and Design of Geodetic Networks	2
GEOSCIM 8871	Advanced Physical Geodesy	3
GEOSCIM 8873	Advanced Satellite Geodesy	3

Table B (select at least 8 hours, can also include excess credits from Table A courses)

Course number	Course Title	Credits
CSE 5523	Machine Learning and Statistical Pattern Recognition	3
CSE 5524	Computer Vision for Human-Computer Interaction	3
EARTHSC 5642	Geomathematical Analysis	3
ECE 5460	Image Processing	3
ECE 6001	Probability and Random Variables	3
ECE 7001	Stochastic Processes, Detection, and Estimation	3
ECE 7866	Computer Vision and Multisensor Integration	3
GEOSCIM 5660	Geometric Reference Systems	4

GEOSCIM 6776	Physical Geodesy	4
GEOSCIM 7763	Advanced Adjustment Computations	4
GEOSCIM 8862	Adjustment Computations for Random Processes	2
MATH 4568	Linear Algebra for Engineering Graduate Students	3
MATH 4578	Discrete Mathematical Models	4
MATH 5601	Essentials of Numerical Methods	3
MATH 5602	Computational Partial Differential Equations	3
MATH 5603	Numerical Linear Algebra	3
MATH 6601	Numerical Methods in Scientific Computing I	4
MATH 6602	Numerical Methods in Scientific Computing II	4
STAT 6450	Applied Regression Analysis	4
STAT 6540	Applied Stochastic Processes	3
STAT 6550	Statistical Analysis of Time Series	2
STAT 6560	Applied Multivariate Analysis	3
STAT 6570	Applied Bayesian Analysis	2
STAT 6950	Applied Statistics II	4

Dissertation Research (at least 30 credits)

Course number	**Course Title**	**Credits**
CIVILEN 8999	Civil Engineering Research for Dissertation	1-15

Master's Degree Transfer (option for block of 30 credits)

Course number	**Course Title**	**Credits**
CIVILEN SPL	Special (transfer credit posted by Graduate School)	30

Electives (balance required to achieve total of 80 credits)

Coursework can be selected from Table A, Table B, Dissertation Research hours, graduate level coursework at OSU approved by faculty advisor, and/or up to 3 credits of CIVILEN 8193.

CIVENG-PH GEO Markup

Doctor of Philosophy (PhD) in Civil Engineering, Geoinformation and Geodetic Engineering track

Table A (select at least 12 hours) and **Table B** (select at least 8 hours) courses move to:
CEGE Depth (6), **CEGE Breadth** (3), **Cross-Disciplinary** (3), and **Data Analysis** (3)
Resulting change: 20 hours of coursework options → 15 hours of options + 7 newly required

CEGE Depth Coursework (select at least 6 credits)
5000 level+ letter graded graduate courses selected in consultation with the advisory committee, directly supporting a deeper understanding within the student's research focus area. Guideline for course selection to include courses from former Table A and Table B.

Course number	Course Title	Credits
CIVILEN 5001	Introduction to Geographic Information Systems	4
CIVILEN 5420	Remote Sensing of Environment	3
CIVILEN 5421	Spatial Analysis Techniques for Civil Engineering	3
CIVILEN 5441	Introduction to GPS: theory and applications	3
CIVILEN 5461	Geospatial Numerical Analysis	4
CIVILEN 6431	GIS and Cartographic Engineering	4
CIVILEN 6435	Global Navigation Satellite Systems (GNSS) Data Processing	3
CIVILEN 6451	Introduction to photogrammetry	4
CIVILEN 7421	Advanced Remote Sensing and Machine Learning	3
CIVILEN 7432	Advanced spatial data structures and databases	4
CIVILEN 7433	GIS Analysis and projects	3
CIVILEN 7442	Fundamentals of GPS and Reference Systems	4
CIVILEN 7452	Spatial Geometry and Spectral Analysis	4
CIVILEN 7453	Photogrammetric computer vision	3
CIVILEN 7461	Advanced geospatial numerical analysis	3
CIVILEN 8420	Radiometric measurements and modeling	3
CIVILEN 8421	Integrating Remote Sensing with Engineering Databases	3
CIVILEN 8434	Advanced planetary mapping and exploration	3
CIVILEN 8443	Advanced topics in GPS	3
CIVILEN 8454	Videogrammetry	3
CIVILEN 8462	Advanced geospatial sensors and methods	3

CEGE Breadth Coursework (select at least 3 credits)
5000 level+ letter graded graduate course(s) selected in consultation with the advisory committee, connecting the research focus within a broader context of other disciplines/specializations. Guideline for course selection to include courses from former Table A, Table B and general program recommendations.

Course number	Course Title	Credits
CIVILEN 5571	Principles of Foundation Analysis and Design	3
CIVILEN 5760	Network Metrics and Control in Transportation Systems	3
CIVILEN 6300	Dynamics of Structures	3
CIVILEN 6451	Introduction to Photogrammetry	3
CIVILEN 7330	Earthquake Engineering	3

CIVILEN 7770	Infrastructure Systems Analysis	3
ENVENG 5120	Bioremediation of Groundwater and Soil	3
ENVENG 5170	Sustainability and the Circular Economy	3
ENVENG 5195	Engineering Design for Environmental Health	3
ENVENG 5600	Science, Engineering, and Public Policy	3
ENVENG 6020	Foundations of Data-Driven Sustainable Energy Systems	3
ENVENG 6200	Fundamentals of Environmental Engineering	3
ENVENG 6400	Integrated Environmental Chemical Fate and Transport	3
ENVENG 6610	Analytic Frameworks for Analysis of Sci., Eng., and Policy	3

Cross-Disciplinary Coursework (select at least 3 credits)
5000 level+ letter graded graduate course(s) offered outside of the Department of Civil, Environmental and Geodetic Engineering selected in consultation with the advisory committee. Guideline for course selection to include courses from former Table A and Table B.

Course number	Course Title	Credits
GEOSCIM 5637	Topics in Mapping	3
GEOSCIM 5652	Adjustment Computations	5
GEOSCIM 6786	Geospatial Data Structures for Computer Mapping and GIS	3
GEOSCIM 7745	Inertial Navigation/Positioning Analysis	4
GEOSCIM 7765	Analysis and Design of Geodetic Networks	2
GEOSCIM 8871	Advanced Physical Geodesy	3
GEOSCIM 8873	Advanced Satellite Geodesy	3
CSE 5523	Machine Learning and Statistical Pattern Recognition	3
CSE 5524	Computer Vision for Human-Computer Interaction	3
EARTHSC 5642	Geomathematical Analysis	3
ECE 5460	Image Processing	3
ECE 6001	Probability and Random Variables	3
ECE 7001	Stochastic Processes, Detection, and Estimation	3
ECE 7866	Computer Vision and Multisensor Integration	3
GEOSCIM 5660	Geometric Reference Systems	4
GEOSCIM 6776	Physical Geodesy	4
GEOSCIM 7763	Advanced Adjustment Computations	4
GEOSCIM 8862	Adjustment Computations for Random Processes	2
MATH 4568	Linear Algebra for Engineering Graduate Students	3
MATH 5601	Essentials of Numerical Methods	3
MATH 5602	Computational Partial Differential Equations	3
MATH 5603	Numerical Linear Algebra	3
MATH 6601	Numerical Methods in Scientific Computing I	4
MATH 6602	Numerical Methods in Scientific Computing II	4
STAT 6450	Applied Regression Analysis	4
STAT 6540	Applied Stochastic Processes	3
STAT 6550	Statistical Analysis of Time Series	2
STAT 6560	Applied Multivariate Analysis	3
STAT 6570	Applied Bayesian Analysis	2
STAT 6950	Applied Statistics II	4

Data Analysis Coursework (select at least 3 credits)
Select from the following, or 5000 level+ letter graded graduate course approved by advisory committee. Guideline for course selection to include courses from former Table A and Table B.

Course number	Course Title	Credits
CIVILEN 7421	Adv. Machine Learning, Remote Sensing Image Interpret.	3
ENVENG 6220	Data Analysis in Environmental Engineering	3
STAT 5301	Intermediate Data Analysis I	4

CEGE Seminar (4 credits)

Course number	Course Title	Credits
CIVILEN 6880	Civil Engineering Graduate Seminar	1 (x4)

Writing (3 credits)

Course number	Course Title	Credits
ENGR 7710	Engineering Research Communications	3

Dissertation Research (at least 30 credits)

Course number	Course Title	Credits
CIVILEN 8999	Civil Engineering Research for Dissertation	1-15/sem.

Master's Degree Transfer (option for block of 30 credits)

Course number	Course Title	Credits
CIVILEN SPL	Special (transfer credit posted by Graduate School)	30

Electives (balance required to achieve total of 80 credits)

Coursework can be selected from ~~Table A, Table B,~~ Depth, Breadth, Cross-disciplinary, Data Analysis, Dissertation Research hours, graduate level coursework at OSU approved by faculty advisor and student's committee, and/or up to 3 credits of CIVILEN 8193.

CIVENG-PH GEO Proposed

Doctor of Philosophy (PhD) in Civil Engineering, Geoinformation and Geodetic Engineering track

CEGE Depth Coursework (select at least 6 credits)

CIVILEN/ENVENG letter graded graduate courses selected in consultation with the advisory committee, directly supporting a deeper understanding within the student's research focus area.

Course number	Course Title	Credits

CEGE Breadth Coursework (select at least 3 credits)

CIVILEN/ENVENG letter graded graduate courses selected in consultation with the advisory committee, connecting the research focus within a broader context of other disciplines/specializations.

Course number	Course Title	Credits

Cross-Disciplinary Coursework (select at least 3 credits)

5000 level+ letter graded graduate course(s) offered outside of CIVILEN/ENVENG selected in consultation with the advisory committee.

Course number	Course Title	Credits

Data Analysis Coursework (select at least 3 credits)

Select from the following, or 5000 level+ letter graded graduate course approved by advisory committee.

Course number	Course Title	Credits
CIVILEN 7421	Adv. Machine Learning, Remote Sensing Image Interpret.	3
ENVENG 6220	Data Analysis in Environmental Engineering	3
STAT 5301	Intermediate Data Analysis I	4

CEGE Seminar (4 credits)

Enroll in the CEGE Graduate Seminar for 1 credit for each of the first 4 semesters in the program.

Course number	Course Title	Credits
CIVILEN 6880	Civil Engineering Graduate Seminar	1 (x4)

Writing (3 credits)

Course number	Course Title	Credits
ENGR 7710	Engineering Research Communications	3

Dissertation Research (at least 30 credits)

Course number	Course Title	Credits
CIVILEN 8999	Civil Engineering Research for Dissertation	1-15/sem.

Master's Degree Transfer (option for block of 30 credits)

Course number	Course Title	Credits
CIVILEN SPL	Special (transfer credit posted by Graduate School)	30

Electives (balance required to achieve total of 80 credits)

Coursework can be selected from Depth, Breadth, Cross-Disciplinary, Data Analysis, Dissertation Research, graded graduate level coursework approved by advisory committee, and/or up to 3 credits of CIVILEN 8193.

Note: A course that conceptually meets the requirement for more than one curricular area can be used to satisfy one requirement or the other, but not both.

CIVENG-PH GEOT Current

Doctor of Philosophy (PhD) in Civil Engineering, Geotechnical Engineering graduate track

Table A (select at least 12 hours)

Course number	Course Title	Credits
CIVILEN 5571	Principles of Foundation Analysis and Design	3
CIVILEN 5581	Numerical Methods in Geotechnical Engineering	3
CIVILEN 5561	Rock Mechanics, Slope Stability and Retaining Structures	3
CIVILEN 5168	Introduction to Finite Element Method	3
CIVILEN 7330	Earthquake Engineering	3
CIVILEN 6300	Structural Dynamics	3
EARTHSC 5651	Hydrogeology	4

Table B (select at least 8 hours, can also include excess credits from Table A courses)

Course number	Course Title	Credits
Recommended:		
CIVILEN 5168	Introduction to Finite Element Method	3
CIVILEN 5320	Intermediate Structural Steel Design	3
CIVILEN 5350	Intermediate Reinforced Concrete Design	3
CIVILEN 5360	Bridge Engineering	3
CIVILEN 5370	Prestressed Concrete Design	3
CIVILEN 6300	Structural Dynamics	3
CIVILEN 7330	Earthquake Engineering	3
CIVILEN 7350	Advanced Reinforced Concrete	3
CIVILEN 5510	Durability & Cond. Assmnt of Reinforced Concrete Structures	3
CIVILEN 5561	Rock Mechanics, Slope Stability and Retaining Structures	3
CIVILEN 5571	Principles of Foundation Analysis and Design	3
CIVILEN 6510	Advanced Concrete Materials	3
CIVILEN 7320	Structural Reliability	3
CIVILEN 8810	Construction Intelligent System and Simulation I	3
CIVILEN 5880	Civil Engineering Departmental Seminar	1
ENVENG 5120	Bioremediation of Soil and Groundwater	3
CIVILEN 5001	Introduction to Geographic Information Systems	4
CIVILEN 7453	Photogrammetric Computer Vision	3
ENR 5262	Soil Chemical Processes and Environmental Quality	3
ENR 5273	Env. Fate and Impact of Contaminants in Soil & Water	3
ENVENG 6610	Analytic Frameworks for Science, Eng. And Policy	3
ENGR 7710	Engineering Research and Communication	3
CIVILEN 5730	Highway Location and Design	3
CIVILEN 7770	Infrastructure Systems Analysis	3
CIVILEN 5420	Remote Sensing of Environment	3
CIVILEN 5421	Spatial Analysis Techniques for Civil Engineering	3
CIVILEN 6451	Introduction to Photogrammetry	4

Alternatives:		
CONSYSM 5670	Green Building and Sustainable Construction	3
CSE 5243	Introduction to Data Mining	3
CSE 5249	Intermediate Studies in Databases	3
CSE 5361	Numerical Methods	3
CSE 5441	Introduction to Parallel Computing	3
CSE 5521	Survey of Artificial Intelligence I: Basic Techniques	3
CSE 5523	Machine Learning and Statistical Pattern Recognition	3
CSE 5526	Introduction to Neural Networks	3
CSE 5531	Introduction to Cognitive Science	3
CSE 6441	Parallel Computing	3
CSE 6449	Advanced Studies in Parallel Computing	3
CSE 6539	Advanced Studies in Artificial Intelligence	3
ECE 5551	State-Space Control Systems	3
ECE 6200	Signal Processing	3
ECE 6202	Stochastic Signal Processing	3
ECE 7854	Nonlinear and Adaptive Control	3
ECE 7858	Intelligent Control	3
ECE 7868	Pattern Recognition and Machine Learning	3
ISE 5200	Linear Optimization	3
ISE 5850	Operations Research Models and Methods	3
ISE 6200	Fundamentals of Optimization	3
ISE 6210	Integer Optimization	3
ISE 7200	Algorithms for Nonlinear Optimization	3
ISE 7210	Large Scale Optimization	3
MATH 6251	Theory of Probability I	3
MECHENG 5134	Introduction to Vibrations of Deformable Solids	3
MECHENG 5139	Applied Finite Element Method	3
MECHENG 5374	Smart Materials and Intelligent Systems	3
MECHENG 7040	Elasticity	3
MECHENG 7100	Introduction to Continuum Mechanics	3
MECHENG 7101	Constitutive Models in Continuum Mechanics	4
MECHENG 7163	Advanced Strength of Materials for Design	3
MECHENG 7250	Vibration of Discrete Systems	3
MECHENG 8038	Advanced Topics in Finite Element Method	2
MECHENG 8042	Nonlinear Finite Element Method	2
STAT 6450	Applied Regression Analysis	4
STAT 6520	Applied Statistical Analysis with Missing Data	3
STAT 6550	Statistical Analysis of Time Series	2
STAT 6560	Applied Multivariate Analysis	3
STAT 5301	Intermediate Data Analysis I	4

Dissertation Research (at least 30 credits)

Course number	**Course Title**	**Credits**
CIVILEN 8999	Civil Engineering Research for Dissertation	1-15

Master's Degree Transfer (option for block of 30 credits)

Course number	Course Title	Credits
CIVILEN SPL	Special (transfer credit posted by Graduate School)	30

Electives (balance required to achieve total of 80 credits)

Coursework can be selected from Table A, Table B, Dissertation Research hours, graduate level coursework at OSU approved by faculty advisor, and/or up to 3 credits of CIVILEN 8193.

CIVENG-PH GEOT Markup

Doctor of Philosophy (PhD) in Civil Engineering, Geotechnical Engineering graduate track

Table A (select at least 12 hours) and **Table B** (select at least 8 hours) courses move to:
CEGE Depth (6), **CEGE Breadth** (3), **Cross-Disciplinary** (3), and **Data Analysis** (3)
Resulting change: 20 hours of coursework options → 15 hours of options + 7 newly required

CEGE Depth Coursework (select at least 6 credits)
5000 level+ letter graded graduate courses selected in consultation with the advisory committee, directly supporting a deeper understanding within the student's research focus area. Guideline for course selection to include courses from former Table A and Table B.

Course number	Course Title	Credits
CIVILEN 5571	Principles of Foundation Analysis and Design	3
CIVILEN 5581	Numerical Methods in Geotechnical Engineering	3
CIVILEN 5561	Rock Mechanics, Slope Stability and Retaining Structures	3
CIVILEN 5168	Introduction to Finite Element Method	3
CIVILEN 7330	Earthquake Engineering	3
CIVILEN 6300	Structural Dynamics	3
EARTHSC 5651	Hydrogeology	4

CEGE Breadth Coursework (select at least 3 credits)
5000 level+ letter graded graduate course(s) selected in consultation with the advisory committee, connecting the research focus within a broader context of other disciplines/specializations. Guideline for course selection to include courses from former Table A and Table B.

Course number	Course Title	Credits
CIVILEN 5168	Introduction to Finite Element Method	3
CIVILEN 5320	Intermediate Structural Steel Design	3
CIVILEN 5350	Intermediate Reinforced Concrete Design	3
CIVILEN 5360	Bridge Engineering	3
CIVILEN 5370	Prestressed Concrete Design	3
CIVILEN 6300	Structural Dynamics	3
CIVILEN 7330	Earthquake Engineering	3
CIVILEN 7350	Advanced Reinforced Concrete	3
CIVILEN 5510	Durability & Cond. Assmnt of Reinforced Concrete Structures	3
CIVILEN 5561	Rock Mechanics, Slope Stability and Retaining Structures	3
CIVILEN 5571	Principles of Foundation Analysis and Design	3
CIVILEN 6510	Advanced Concrete Materials	3
CIVILEN 7320	Structural Reliability	3
CIVILEN 8810	Construction Intelligent System and Simulation I	3
CIVILEN 5880	Civil Engineering Departmental Seminar	1
CIVILEN 5001	Introduction to Geographic Information Systems	4
CIVILEN 7453	Photogrammetric Computer Vision	3
CIVILEN 5730	Highway Location and Design	3
CIVILEN 7770	Infrastructure Systems Analysis	3

CIVILEN 5420	Remote Sensing of Environment	3
CIVILEN 5421	Spatial Analysis Techniques for Civil Engineering	3
CIVILEN 6451	Introduction to Photogrammetry	4

Cross-Disciplinary Coursework (select at least 3 credits)
5000 level+ letter graded graduate course(s) offered outside of the Department of Civil, Environmental and Geodetic Engineering selected in consultation with the advisory committee. Guideline for course selection to include courses from former Table A and Table B.

Course number	Course Title	Credits
EARTHSC 5651	Hydrogeology	4
ENVENG 5120	Bioremediation of Soil and Groundwater	3
ENR 5262	Soil Chemical Processes and Environmental Quality	3
ENR 5273	Env. Fate and Impact of Contaminants in Soil & Water	3
ENVENG 6610	Analytic Frameworks for Science, Eng. And Policy	3
CONSYSM 5670	Green Building and Sustainable Construction	3
CSE 5243	Introduction to Data Mining	3
CSE 5249	Intermediate Studies in Databases	3
CSE 5361	Numerical Methods	3
CSE 5441	Introduction to Parallel Computing	3
CSE 5521	Survey of Artificial Intelligence I: Basic Techniques	3
CSE 5523	Machine Learning and Statistical Pattern Recognition	3
CSE 5526	Introduction to Neural Networks	3
CSE 5531	Introduction to Cognitive Science	3
CSE 6441	Parallel Computing	3
CSE 6449	Advanced Studies in Parallel Computing	3
CSE 6539	Advanced Studies in Artificial Intelligence	3
ECE 5551	State-Space Control Systems	3
ECE 6200	Signal Processing	3
ECE 6202	Stochastic Signal Processing	3
ECE 7854	Nonlinear and Adaptive Control	3
ECE 7858	Intelligent Control	3
ECE 7868	Pattern Recognition and Machine Learning	3
ISE 5200	Linear Optimization	3
ISE 5850	Operations Research Models and Methods	3
ISE 6200	Fundamentals of Optimization	3
ISE 6210	Integer Optimization	3
ISE 7200	Algorithms for Nonlinear Optimization	3
ISE 7210	Large Scale Optimization	3
MATH 6251	Theory of Probability I	3
MECHENG 5134	Introduction to Vibrations of Deformable Solids	3
MECHENG 5139	Applied Finite Element Method	3
MECHENG 5374	Smart Materials and Intelligent Systems	3
MECHENG 7040	Elasticity	3
MECHENG 7100	Introduction to Continuum Mechanics	3
MECHENG 7101	Constitutive Models in Continuum Mechanics	4

MECHENG 7163	Advanced Strength of Materials for Design	3
MECHENG 7250	Vibration of Discrete Systems	3
MECHENG 8038	Advanced Topics in Finite Element Method	2
MECHENG 8042	Nonlinear Finite Element Method	2
STAT 6450	Applied Regression Analysis	4
STAT 6520	Applied Statistical Analysis with Missing Data	3
STAT 6550	Statistical Analysis of Time Series	2
STAT 6560	Applied Multivariate Analysis	3
STAT 5301	Intermediate Data Analysis I	4

Data Analysis Coursework (select at least 3 credits)
Select from the following, or 5000 level+ letter graded graduate course approved by advisory committee. Guideline for course selection to include courses from former Table A and Table B.

Course number	Course Title	Credits
CIVILEN 7421	Adv. Machine Learning, Remote Sensing Image Interpret.	3
ENVENG 6220	Data Analysis in Environmental Engineering	3
STAT 5301	Intermediate Data Analysis I	4

CEGE Seminar (4 credits)

Course number	Course Title	Credits
CIVILEN 6880	Civil Engineering Graduate Seminar	1 (x4)

Writing (3 credits)

Course number	Course Title	Credits
ENGR 7710	Engineering Research Communications	3

Dissertation Research (at least 30 credits)

Course number	Course Title	Credits
CIVILEN 8999	Civil Engineering Research for Dissertation	1-15/sem.

Master's Degree Transfer (option for block of 30 credits)

Course number	Course Title	Credits
CIVILEN SPL	Special (transfer credit posted by Graduate School)	30

Electives (balance required to achieve total of 80 credits)

Coursework can be selected from ~~Table A, Table B,~~ Depth, Breadth, Cross-disciplinary, Data Analysis, Dissertation Research hours, graduate level coursework at OSU approved by faculty advisor and student's committee, and/or up to 3 credits of CIVILEN 8193.

CIVENG-PH GEOT Proposed

Doctor of Philosophy (PhD) in Civil Engineering, Geotechnical Engineering graduate track

CEGE Depth Coursework (select at least 6 credits)
CIVILEN/ENVENG letter graded graduate courses selected in consultation with the advisory committee, directly supporting a deeper understanding within the student's research focus area.

Course number	Course Title	Credits

CEGE Breadth Coursework (select at least 3 credits)
CIVILEN/ENVENG letter graded graduate courses selected in consultation with the advisory committee, connecting the research focus within a broader context of other disciplines/specializations.

Course number	Course Title	Credits

Cross-Disciplinary Coursework (select at least 3 credits)
5000 level+ letter graded graduate course(s) offered outside of CIVILEN/ENVENG selected in consultation with the advisory committee.

Course number	Course Title	Credits

Data Analysis Coursework (select at least 3 credits)
Select from the following, or 5000 level+ letter graded graduate course approved by advisory committee.

Course number	Course Title	Credits
CIVILEN 7421	Adv. Machine Learning, Remote Sensing Image Interpret.	3
ENVENG 6220	Data Analysis in Environmental Engineering	3
STAT 5301	Intermediate Data Analysis I	4

CEGE Seminar (4 credits)
Enroll in the CEGE Graduate Seminar for 1 credit for each of the first 4 semesters in the program.

Course number	Course Title	Credits
CIVILEN 6880	Civil Engineering Graduate Seminar	1 (x4)

Writing (3 credits)

Course number	Course Title	Credits
ENGR 7710	Engineering Research Communications	3

Dissertation Research (at least 30 credits)

Course number	Course Title	Credits
CIVILEN 8999	Civil Engineering Research for Dissertation	1-15/sem.

Master's Degree Transfer (option for block of 30 credits)

Course number	Course Title	Credits
CIVILEN SPL	Special (transfer credit posted by Graduate School)	30

Electives (balance required to achieve total of 80 credits)

Coursework can be selected from Depth, Breadth, Cross-Disciplinary, Data Analysis, Dissertation Research, graded graduate level coursework approved by advisory committee, and/or up to 3 credits of CIVILEN 8193.

Note: A course that conceptually meets the requirement for more than one curricular area can be used to satisfy one requirement or the other, but not both.

CIVENG-PH STR Current

Doctor of Philosophy (PhD) in Civil Engineering, Structural Engineering graduate track

Table A (select at least 12 hours)

Course number	Course Title	Credits
CIVILEN 5168	Introduction to Finite Element Method	3
CIVILEN 5320	Intermediate Structural Steel Design	3
CIVILEN 5350	Intermediate Reinforced Concrete Design	3
CIVILEN 5360	Bridge Engineering	3
CIVILEN 5370	Prestressed Concrete Design	3
CIVILEN 6300	Structural Dynamics	3
CIVILEN 7330	Earthquake Engineering	3
CIVILEN 7350	Advanced Reinforced Concrete	3

Table B (select at least 8 hours, can also include excess credits from Table A courses)

Course number	Course Title	Credits
Recommended:		
CIVILEN 5510	Durability & Cond. Assmnt of Reinforced Concrete Structures	3
CIVILEN 5561	Principles of Soil and Rock Mechanics	3
CIVILEN 5571	Principles of Foundation Analysis and Design	3
CIVILEN 6510	Advanced Concrete Materials	3
CIVILEN 7320	Structural Reliability	3
CIVILEN 8810	Construction Intelligent System and Simulation I	3
Possible alternatives:		
CONSYSM 5670	Green Building and Sustainable Construction	3
CSE 5243	Introduction to Data Mining	3
CSE 5249	Intermediate Studies in Databases	3
CSE 5361	Numerical Methods	3
CSE 5441	Introduction to Parallel Computing	3
CSE 5521	Survey of Artificial Intelligence I: Basic Techniques	3
CSE 5523	Machine Learning and Statistical Pattern Recognition	3
CSE 5526	Introduction to Neural Networks	3
CSE 5531	Introduction to Cognitive Science	3
CSE 6441	Parallel Computing	3
CSE 6449	Advanced Studies in Parallel Computing	3
CSE 6539	Advanced Studies in Artificial Intelligence	3
ECE 5551	State-Space Control Systems	3
ECE 6200	Signal Processing	3
ECE 6202	Stochastic Signal Processing	3
ECE 7854	Nonlinear and Adaptive Control	3
ECE 7858	Intelligent Control	3
ECE 7868	Pattern Recognition and Machine Learning	3
ISE 5200	Linear Optimization	3
ISE 5850	Operations Research Models and Methods	3

ISE 6200	Fundamentals of Optimization	3
ISE 6210	Integer Optimization	3
ISE 7200	Algorithms for Nonlinear Optimization	3
ISE 7210	Large Scale Optimization	3
MATH 6251	Theory of Probability I	3
MECHENG 5134	Introduction to Vibrations of Deformable Solids	3
MECHENG 5139	Applied Finite Element Method	3
MECHENG 5374	Smart Materials and Intelligent Systems	3
MECHENG 7040	Elasticity	3
MECHENG 7100	Introduction to Continuum Mechanics	3
MECHENG 7101	Constitutive Models in Continuum Mechanics	4
MECHENG 7163	Advanced Strength of Materials for Design	3
MECHENG 7250	Vibration of Discrete Systems	3
MECHENG 8038	Advanced Topics in Finite Element Method	2
MECHENG 8042	Nonlinear Finite Element Method	2
STAT 6450	Applied Regression Analysis	4
STAT 6520	Applied Statistical Analysis with Missing Data	3
STAT 6550	Statistical Analysis of Time Series	2
STAT 6560	Applied Multivariate Analysis	3

Dissertation Research (at least 30 credits)

Course number	**Course Title**	**Credits**
CIVILEN 8999	Civil Engineering Research for Dissertation	1-15

Master's Degree Transfer (option for block of 30 credits)

Course number	**Course Title**	**Credits**
CIVILEN SPL	Special (transfer credit posted by Graduate School)	30

Electives (balance required to achieve total of 80 credits)

Coursework can be selected from Table A, Table B, Dissertation Research hours, graduate level coursework at OSU approved by faculty advisor, and/or up to 3 credits of CIVILEN 8193.

CIVENG-PH STR Markup

Doctor of Philosophy (PhD) in Civil Engineering, Structural Engineering graduate track

Table A (select at least 12 hours) and **Table B** (select at least 8 hours) courses move to:
CEGE Depth (6), **CEGE Breadth** (3), **Cross-Disciplinary** (3), and **Data Analysis** (3)
Resulting change: 20 hours of coursework options → 15 hours of options + 7 newly required

CEGE Depth Coursework (select at least 6 credits)
5000 level+ letter graded graduate courses selected in consultation with the advisory committee, directly supporting a deeper understanding within the student's research focus area. Guideline for course selection to include courses from former Table A and Table B.

Course number	Course Title	Credits
CIVILEN 5168	Introduction to Finite Element Method	3
CIVILEN 5320	Intermediate Structural Steel Design	3
CIVILEN 5350	Intermediate Reinforced Concrete Design	3
CIVILEN 5360	Bridge Engineering	3
CIVILEN 5370	Prestressed Concrete Design	3
CIVILEN 6300	Structural Dynamics	3
CIVILEN 7330	Earthquake Engineering	3
CIVILEN 7350	Advanced Reinforced Concrete	3

CEGE Breadth Coursework (select at least 3 credits)
5000 level+ letter graded graduate course(s) selected in consultation with the advisory committee, connecting the research focus within a broader context of other disciplines/specializations. Guideline for course selection to include courses from former Table A and Table B.

Course number	Course Title	Credits
CIVILEN 5510	Durability & Cond. Assmnt of Reinforced Concrete Structures	3
CIVILEN 5561	Principles of Soil and Rock Mechanics	3
CIVILEN 5571	Principles of Foundation Analysis and Design	3
CIVILEN 6510	Advanced Concrete Materials	3
CIVILEN 7320	Structural Reliability	3
CIVILEN 8810	Construction Intelligent System and Simulation I	3

Cross-Disciplinary Coursework (select at least 3 credits)
5000 level+ letter graded graduate course(s) offered outside of the Department of Civil, Environmental and Geodetic Engineering selected in consultation with the advisory committee. Guideline for course selection to include courses from former Table A and Table B.

Course number	Course Title	Credits
CONSYSM 5670	Green Building and Sustainable Construction	3
CSE 5243	Introduction to Data Mining	3
CSE 5249	Intermediate Studies in Databases	3
CSE 5361	Numerical Methods	3
CSE 5441	Introduction to Parallel Computing	3

CSE 5521	Survey of Artificial Intelligence I: Basic Techniques	3
CSE 5523	Machine Learning and Statistical Pattern Recognition	3
CSE 5526	Introduction to Neural Networks	3
CSE 5531	Introduction to Cognitive Science	3
CSE 6441	Parallel Computing	3
CSE 6449	Advanced Studies in Parallel Computing	3
CSE 6539	Advanced Studies in Artificial Intelligence	3
ECE 5551	State-Space Control Systems	3
ECE 6200	Signal Processing	3
ECE 6202	Stochastic Signal Processing	3
ECE 7854	Nonlinear and Adaptive Control	3
ECE 7858	Intelligent Control	3
ECE 7868	Pattern Recognition and Machine Learning	3
ISE 5200	Linear Optimization	3
ISE 5850	Operations Research Models and Methods	3
ISE 6200	Fundamentals of Optimization	3
ISE 6210	Integer Optimization	3
ISE 7200	Algorithms for Nonlinear Optimization	3
ISE 7210	Large Scale Optimization	3
MECHENG 5134	Introduction to Vibrations of Deformable Solids	3
MECHENG 5139	Applied Finite Element Method	3
MECHENG 5374	Smart Materials and Intelligent Systems	3
MECHENG 7040	Elasticity	3
MECHENG 7100	Introduction to Continuum Mechanics	3
MECHENG 7101	Constitutive Models in Continuum Mechanics	4
MECHENG 7163	Advanced Strength of Materials for Design	3
MECHENG 7250	Vibration of Discrete Systems	3
MECHENG 8038	Advanced Topics in Finite Element Method	2
MECHENG 8042	Nonlinear Finite Element Method	2

Data Analysis Coursework (select at least 3 credits)

Select from the following, or 5000 level+ letter graded graduate course approved by advisory committee. Guideline for course selection to include courses from former Table A and Table B.

Course number	Course Title	Credits
CIVILEN 7421	Adv. Machine Learning, Remote Sensing Image Interpret.	3
ENVENG 6220	Data Analysis in Environmental Engineering	3
STAT 5301	Intermediate Data Analysis I	4

CEGE Seminar (4 credits)

Course number	Course Title	Credits
CIVILEN 6880	Civil Engineering Graduate Seminar	1 (x4)

Writing (3 credits)

Course number	Course Title	Credits
ENGR 7710	Engineering Research Communications	3

Dissertation Research (at least 30 credits)

Course number	Course Title	Credits
CIVILEN 8999	Civil Engineering Research for Dissertation	1-15/sem.

Master's Degree Transfer (option for block of 30 credits)

Course number	Course Title	Credits
CIVILEN SPL	Special (transfer credit posted by Graduate School)	30

Electives (balance required to achieve total of 80 credits)

Coursework can be selected from ~~Table A, Table B,~~ Depth, Breadth, Cross-disciplinary, Data Analysis, Dissertation Research hours, graduate level coursework at OSU approved by faculty advisor and student's committee, and/or up to 3 credits of CIVILEN 8193.

CIVENG-PH STR Proposed

Doctor of Philosophy (PhD) in Civil Engineering, Structural Engineering graduate track

CEGE Depth Coursework (select at least 6 credits)
CIVILEN/ENVENG letter graded graduate courses selected in consultation with the advisory committee, directly supporting a deeper understanding within the student's research focus area.

Course number	Course Title	Credits

CEGE Breadth Coursework (select at least 3 credits)
CIVILEN/ENVENG letter graded graduate courses selected in consultation with the advisory committee, connecting the research focus within a broader context of other disciplines/specializations.

Course number	Course Title	Credits

Cross-Disciplinary Coursework (select at least 3 credits)
5000 level+ letter graded graduate course(s) offered outside of CIVILEN/ENVENG selected in consultation with the advisory committee.

Course number	Course Title	Credits

Data Analysis Coursework (select at least 3 credits)
Select from the following, or 5000 level+ letter graded graduate course approved by advisory committee.

Course number	Course Title	Credits
CIVILEN 7421	Adv. Machine Learning, Remote Sensing Image Interpret.	3
ENVENG 6220	Data Analysis in Environmental Engineering	3
STAT 5301	Intermediate Data Analysis I	4

CEGE Seminar (4 credits)
Enroll in the CEGE Graduate Seminar for 1 credit for each of the first 4 semesters in the program.

Course number	Course Title	Credits
CIVILEN 6880	Civil Engineering Graduate Seminar	1 (x4)

Writing (3 credits)

Course number	Course Title	Credits
ENGR 7710	Engineering Research Communications	3

Dissertation Research (at least 30 credits)

Course number	Course Title	Credits
CIVILEN 8999	Civil Engineering Research for Dissertation	1-15/sem.

Master's Degree Transfer (option for block of 30 credits)

Course number	Course Title	Credits
CIVILEN SPL	Special (transfer credit posted by Graduate School)	30

Electives (balance required to achieve total of 80 credits)

Coursework can be selected from Depth, Breadth, Cross-Disciplinary, Data Analysis, Dissertation Research, graded graduate level coursework approved by advisory committee, and/or up to 3 credits of CIVILEN 8193.

Note: A course that conceptually meets the requirement for more than one curricular area can be used to satisfy one requirement or the other, but not both.

CIVENG-PH TRN Current

Doctor of Philosophy (PhD) in Civil Engineering, Transportation Engineering graduate track

Table A (select at least 12 hours)

Course number	Course Title	Credits
CIVILEN 7730	Transportation Demand Modeling	4
CIVILEN 7740	Urban Transportation Network Analysis	4
CIVILEN 7760	Transportation Management Systems	3
CIVILEN 7770	Infrastructure Systems Analysis	3

Table B (select at least 8 hours, can also include excess credits from Table A courses)

Course number	Course Title	Credits
CIVILEN 5001	Introduction to Geographic Information Systems	4
CIVILEN 5300	Airport Planning, Design, and Development	3
CIVILEN 5700	Urban Transportation Demand Forecasting	3
CIVILEN 5720	Transportation Engineering Data Collection Studies	3
CIVILEN 5730	Highway Location and Design	3
CIVILEN 5740	Design and Operation of Road Traffic Facilities	3
CIVILEN 5750	Instrumentation, Signals, and Control in Trn. Applications	3
CIVILEN 5760	Network Metrics and Control in Transportation Systems	3
CIVILEN 5770	Urban Public Transportation	3
CRPLAN 5600	Adv. Urban Plan Survey Collec., Mgmt. & Analysis Methods	3
GEOG 5300	Geography of Transportation	3
GEOG 5301	Sustainable Transportation	3
STAT 6201	Mathematical Statistics	4
STAT 6301	Probability for Statistical Inference	3
STAT 6450	Applied Regression Analysis (OR ECON 5410 Econometrics I)	4
ECON 5410	Econometrics I (OR STAT 6450 Applied Regression Analysis)	3

Dissertation Research (at least 30 credits)

Course number	Course Title	Credits
CIVILEN 8999	Civil Engineering Research for Dissertation	1-15

Master's Degree Transfer (option for block of 30 credits)

Course number	Course Title	Credits
CIVILEN SPL	Special (transfer credit posted by Graduate School)	30

Electives (balance required to achieve total of 80 credits)

Coursework can be selected from Table A, Table B, Dissertation Research hours, graduate level coursework at OSU approved by faculty advisor, and/or up to 3 credits of CIVILEN 8193.

CIVENG-PH TRN Markup

Doctor of Philosophy (PhD) in Civil Engineering, Transportation Engineering graduate track

Table A (select at least 12 hours) and **Table B** (select at least 8 hours) courses move to:
CEGE Depth (6), **CEGE Breadth** (3), **Cross-Disciplinary** (3), and **Data Analysis** (3)
Resulting change: 20 hours of coursework options → 15 hours of options + 7 newly required

CEGE Depth Coursework (select at least 6 credits)
5000 level+ letter graded graduate courses selected in consultation with the advisory committee, directly supporting a deeper understanding within the student's research focus area. Guideline for course selection to include courses from former Table A and Table B.

Course number	Course Title	Credits
CIVILEN 7730	Transportation Demand Modeling	4
CIVILEN 7740	Urban Transportation Network Analysis	4
CIVILEN 7760	Transportation Management Systems	3
CIVILEN 7770	Infrastructure Systems Analysis	3

CEGE Breadth Coursework (select at least 3 credits)
5000 level+ letter graded graduate course(s) selected in consultation with the advisory committee, connecting the research focus within a broader context of other disciplines/specializations. Guideline for course selection to include courses from former Table A and Table B.

Course number	Course Title	Credits
CIVILEN 5001	Introduction to Geographic Information Systems	4
CIVILEN 5300	Airport Planning, Design, and Development	3
CIVILEN 5700	Urban Transportation Demand Forecasting	3
CIVILEN 5720	Transportation Engineering Data Collection Studies	3
CIVILEN 5730	Highway Location and Design	3
CIVILEN 5740	Design and Operation of Road Traffic Facilities	3
CIVILEN 5750	Instrumentation, Signals, and Control in Trn. Applications	3
CIVILEN 5760	Network Metrics and Control in Transportation Systems	3
CIVILEN 5770	Urban Public Transportation	3

Cross-Disciplinary Coursework (select at least 3 credits)
5000 level+ letter graded graduate course(s) offered outside of the Department of Civil, Environmental and Geodetic Engineering selected in consultation with the advisory committee. Guideline for course selection to include courses from former Table A and Table B.

Course number	Course Title	Credits
CRPLAN 5600	Adv. Urban Plan Survey Collec., Mgmt. & Analysis Methods	3
GEOG 5300	Geography of Transportation	3
GEOG 5301	Sustainable Transportation	3

Data Analysis Coursework (select at least 3 credits)
Select from the following, or 5000 level+ letter graded graduate course approved by advisory committee. Guideline for course selection to include courses from former Table A and Table B.

Course number	Course Title	Credits
CIVILEN 7421	Adv. Machine Learning, Remote Sensing Image Interpret.	3
ENVENG 6220	Data Analysis in Environmental Engineering	3
STAT 5301	Intermediate Data Analysis I	4

CEGE Seminar (4 credits)

Course number	Course Title	Credits
CIVILEN 6880	Civil Engineering Graduate Seminar	1 (x4)

Writing (3 credits)

Course number	Course Title	Credits
ENGR 7710	Engineering Research Communications	3

Dissertation Research (at least 30 credits)

Course number	Course Title	Credits
CIVILEN 8999	Civil Engineering Research for Dissertation	1-15/sem.

Master's Degree Transfer (option for block of 30 credits)

Course number	Course Title	Credits
CIVILEN SPL	Special (transfer credit posted by Graduate School)	30

Electives (balance required to achieve total of 80 credits)

Coursework can be selected from ~~Table A, Table B,~~ Depth, Breadth, Cross-disciplinary, Data Analysis, Dissertation Research hours, graduate level coursework at OSU approved by faculty advisor and student's committee, and/or up to 3 credits of CIVILEN 8193.

CIVENG-PH TRN Proposed

Doctor of Philosophy (PhD) in Civil Engineering, Transportation Engineering graduate track

CEGE Depth Coursework (select at least 6 credits)
CIVILEN/ENVENG letter graded graduate courses selected in consultation with the advisory committee, directly supporting a deeper understanding within the student's research focus area.

Course number	Course Title	Credits

CEGE Breadth Coursework (select at least 3 credits)
CIVILEN/ENVENG letter graded graduate courses selected in consultation with the advisory committee, connecting the research focus within a broader context of other disciplines/specializations.

Course number	Course Title	Credits

Cross-Disciplinary Coursework (select at least 3 credits)
5000 level+ letter graded graduate course(s) offered outside of CIVILEN/ENVENG selected in consultation with the advisory committee.

Course number	Course Title	Credits

Data Analysis Coursework (select at least 3 credits)
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ENGR 7710	Engineering Research Communications	3

Dissertation Research (at least 30 credits)

Course number	Course Title	Credits
CIVILEN 8999	Civil Engineering Research for Dissertation	1-15/sem.

Master's Degree Transfer (option for block of 30 credits)

Course number	Course Title	Credits
CIVILEN SPL	Special (transfer credit posted by Graduate School)	30

Electives (balance required to achieve total of 80 credits)

Coursework can be selected from Depth, Breadth, Cross-Disciplinary, Data Analysis, Dissertation Research, graded graduate level coursework approved by advisory committee, and/or up to 3 credits of CIVILEN 8193.

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