



Civil, Geological, and Environmental Engineering Department

Undergraduate Student Handbook

2022-2023 Academic Year



UAF CIVIL, GEOLOGICAL, AND ENVIRONMENTAL ENGINEERING DEPARTMENT
Undergraduate Student Handbook

Updated September 9, 2022

Dear Civil or Geological Engineering Student:

As a new student entering our programs, you are embarking on a career path that can provide you with many years of professional and personal fulfillment. The academic program you have chosen is a demanding one and you will be asked to work hard. We think it is worth it and hope you will agree in four years when you walk proudly down the aisle in your cap and gown at graduation.

This is **the 2022–2023 Edition** of the *CIVIL, GEOLOGICAL, AND ENVIRONMENTAL ENGINEERING UNDERGRADUATE STUDENT HANDBOOK*. Read this student guide at your earliest convenience. Changes in the curriculum and procedures occur frequently and there are new facts in this guide that you need to know. You will gain a good overview of the Department of Civil, Geological, and Environmental Engineering, the College of Engineering and Mines, and the University of Alaska Fairbanks. This guide should be used in conjunction with the University of Alaska Fairbanks Academic Catalog and Class Schedule. If at any point you have questions regarding your program of study, career objectives, or anything you cannot find guidance on in this handbook, please reach out to your assigned departmental advisor or me. One benefit of our small programs is the personal interaction you will have with your faculty and staff - we will do everything we can to make sure you enjoy your engineering education here at UAF.

Welcome to our engineering team!



Margaret Darrow
Professor and Chair
Department of Civil, Geological, and Environmental Engineering

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1. FACULTY AND STAFF ROSTER

The office locations and phone numbers for the Civil, Geological, and Environmental Engineering (CGEE) faculty and staff are given below. CGEE Faculty and staff are distributed across [Duckering](#) and the [Engineering, Learning, and Innovation Facility \(ELIF\)](#) buildings. All faculty members have office hours for students, but students are welcome to stop by at other times as well. In addition, all faculty and staff can be reached via email.



Jill Riddle

Office Manager

Department of Civil, Geological, and Environmental Engineering
Department of Mining and Mineral Engineering

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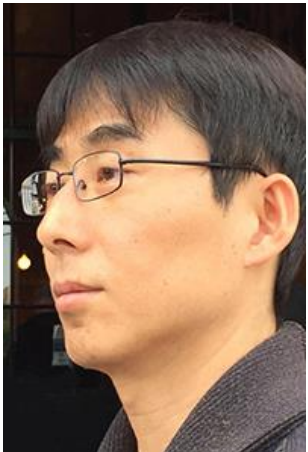


Srijan Aggarwal

Associate Professor | Civil and Environmental Engineering
Water Environmental Research Center

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Research Interests: environmental engineering; water and wastewater treatment systems; biofilm mechanical properties and processes; chemical herders for oil spill response; air quality



Il-Sang Ahn

Assistant Professor, Civil and Environmental Engineering

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Research Interests: dynamic ratchetting in elastic-plastic materials; application of nonlinear dynamics to earthquake engineering; civil applications of Tire Derived Aggregate (TDA); long-term characteristics of concrete at cold temperatures; thermo-mechanical behavior of lunar regolith under temperature cycling



David Barnes

Professor | Civil and Environmental Engineering

Associate Dean, Research
Interim Director, Institute of Northern Engineering

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Research Interests: Groundwater dynamics, contaminant hydrology, groundwater interaction with permafrost, cold regions environmental engineering



Nathan Belz

Associate Professor | Civil and Environmental Engineering

Arctic Infrastructure Development Center

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Research Interests: driver behavior and traffic safety and operations; roundabouts; developing transportation solutions for rural areas; applications of GIS in civil engineering



Margaret Darrow

Professor | Geological Engineering
Department Chair | Civil, Geological, and Environmental Engineering

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Research Interest: behavior of unfrozen water in frozen soils; frost heaving; soil physics; slope stability in frozen ground; thermal analysis of engineered structures over frozen ground



Nima Farzadnia

Assistant Professor | Civil Engineering

nfarzadnia@alaska.edu | ELIF 132

Research Interests: sustainable construction materials and technologies (alternative binders; supplementary cementitious materials; CO2 sequestration systems); smart infrastructure materials and systems (nanotechnology; responsive/adaptive polymers); automation in construction (additive and robotic construction; multi-sensory inspection; big data and cloud computing)



Shishay Kidanu

Assistant Professor | Geological Engineering

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Research Interests: engineering and environmental geophysics; geophysics for mineral exploration; GIS and remote sensing applications in geohazard analysis; GIS-based multivariate geospatial analysis



Debu Misra

Professor | Geological Engineering

Water Environmental Research Center

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Research Interests: geohydrology and geoenvironmental engineering; ground water mechanics; multiphase flow and transport in porous media; reservoir characterization; geostatistical analysis and inverse modeling application of GIS to engineering and management; remote sensing thermodynamics and heat transfer



Yuri Shur

Professor | Civil and Environmental Engineering

Water Environmental Research Center

yshur@alaska.edu | 907-474-7067 | DUCKERING 237

Research Interests: permafrost and ground ice; permafrost related hazards; thermal interaction of structures with permafrost; design alternatives for buildings and pipelines in permafrost region



Sveta Stuefer

Associate Professor | Civil and Environmental Engineering

Water Environmental Research Center

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Research Interests: cold region hydrology and water resources; field measurements and modeling; seasonal snow cover and ice; streamflow; precipitation



Horacio Toniolo

Professor | Civil and Environmental Engineering

Water Environmental Research Center

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Research Interests: sediment transport in rivers; hydrology and hydraulics in cold regions river morphology; reservoir sedimentation; water use in cold regions; turbidity currents



Wilhelm Muench

Adjunct Instructor | Civil and Environmental Engineering

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Courses: surveying, statics, dynamics, steel bridge

2. PROGRAM ACCREDITATION

The UAF BS CE and GE programs have been accredited by the Accreditation Board for Engineering and Technology (ABET; <http://www.abet.org>) and its predecessor since 1940 and 1941, respectively. ABET accreditation provides assurance that a college or university program meets the quality standards of the profession. Each program undergoes a peer review by reviewers from other ABET-accredited universities every 6 years. The UAF CGEE department seeks input from the professional engineering community, as represented by the advisory board, on an ongoing basis to set program objectives and improve the curriculum and learning outcomes.

Faculty members in both programs assess the following student outcomes multiple times in each 6-year review cycle:

Students have:

- 1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics*
- 2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors*
- 3. an ability to communicate effectively with a range of audiences*
- 4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts*
- 5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives*
- 6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions*
- 7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies*
- 8. (specific to CE): knowledge of northern issues,*
- 8. (specific to GE): a knowledge of engineering applications as related to geological resources and geohazards in Alaska and an ability to practice engineering in Arctic-related projects.*

Student work samples are collected for each of these outcomes. In CE, each student work sample is evaluated by three faculty members to assess whether the outcomes are met based on a set of rubrics. Based on the outcome assessment results, the civil engineering faculty makes improvements to the curriculum. In GE, each faculty member assesses his or her students' work, and all faculty members meet to evaluate the results and identify ways to improve the curriculum. ***Please consider working with the instructors of your courses to collect the samples from you to fulfill these accreditation requirements.***

3. PROGRAM CURRICULA

The most current information on the CE and GE curricula is contained in the 2022–2023 University of Alaska Fairbanks Undergraduate Catalog. As a new student entering in the fall of 2022, you should keep a copy of this catalog (which is online) as it sets the requirements that you will need to follow to receive a degree. The department faculty may revise the curriculum to meet the programs' educational objectives, but your graduation requirements are established by the 2022–2023 catalog.

As detailed in the following pages, both the civil engineering and geological engineering curricula require four mathematics courses (MATH F251, MATH F252, MATH F253, MATH F302), two physics courses (PHYS F211, PHYS F212), two chemistry courses (CHEM F105, CHEM F106), two English courses (WRTG 111, WRTG 21X), and a course in public speaking (COJO XXX). These courses are dispersed throughout the undergraduate curriculum. In addition, there are six [General Education Requirement \(GER\) electives](#), a library science requirement (LS F101), and an [Alaska Native-themed requirement](#). The remaining courses are in engineering or other technical areas.

As you progress through your course of study, keep in mind that engineers design and build projects for people. Beyond simply understanding the technical aspects and execution of design, you must also be sensitive to the fact that your projects will have significant effects on your community and the spaces and environment in which we live. You have a tremendous responsibility not to jeopardize the significant trust that the public places in us and our profession. For this reason, the Code of Ethics put forth by the American Society of Civil Engineers states in part that “Engineers shall hold paramount the safety, health and welfare of the public and shall strive to comply with the principles of sustainable development in the performance of their professional duties.” In most cases, civil and geological engineers need to become licensed by the state, what is known as becoming a [Registered Professional Engineer \(PE\)](#), in which they plan to practice. This is true of the State of Alaska. Many of the faculty in the Civil, Geological, and Environmental Engineering Department are registered PEs. The curriculum that you will execute over the next four years will set the path toward obtaining professional licensure.

3.1. CIVIL ENGINEERING OVERVIEW

The Civil Engineering program at UAF has been accredited since 1940 and is currently accredited by the Engineering Accreditation Commission of ABET. All engineering programs in the department give special attention to problems of Northern regions.

The program educational objectives of the B.S. in civil engineering program are:

- Our graduates use their education to pursue professional careers in civil engineering and/or related fields in the public or private sectors, and/or graduate education.
- Our graduates possess knowledge required to meet the challenges of civil engineering problems, including those unique to remote locations and cold regions including Alaska.
- Our graduates demonstrate professionalism through clear communication, actively serving the community, teamwork, commitment to ethical standards, and pursuit of licensure.

Based on the educational objectives of the engineering program, within five years of obtaining your degree you can expect to be:

- Practicing the disciplines of transportation, environmental, structural, water resources, and geotechnical engineering, and/or related fields.
- Engaging in advanced education, research, and development.
- Pursuing continuing education and professional licensure.
- Promoting and advancing public health and safety, and enhancing quality of life.
- Acting in a responsible, professional, and ethical manner.

3.2. CIVIL ENGINEERING CONCENTRATIONS

The main focus areas offered by the Civil Engineering program are described below. Students can also earn a concentration as part of their degree that must be declared with the Civil Engineering program before the start of their final semester.

- Transportation | roadway design and planning, pavement design, railway lines, ship harbors and docks, airport runways, and pipelines
- Environmental | interaction of engineering, soil science, chemistry, and biology to resolve environmental problems; design of wastewater treatment facilities
- Water Resources | hydrology and design of water resources such as groundwater, surface water, and watershed engineering; design of water delivery networks
- Structures and Mechanics | mechanics, modelling, and design of structural systems such as bridges and buildings; includes considerations of seismic and wind loads
- Geotechnical | engineering behavior of soil, and design of foundations, earth retaining walls, tunnels, and earthen dams

The Civil and Environmental Engineering program requirements can be found [here](#). Additionally, the current road map (a document which outlines the typical path taken by students in achieving a four-year degree) and flow chart for the progression of courses can be found at the end of this document.

3.3. GEOLOGICAL ENGINEERING OVERVIEW

Geological engineers apply their strong background in geology and engineering science to solve problems at the intersection of the natural and built environments. They use their knowledge and interpretation of the Earth's surface and near-subsurface to: recognize and mitigate geohazards, such as landslides, floods, and earthquakes; identify, develop, and protect groundwater resources; locate and investigate potential sites for infrastructure and property development; and locate and harvest natural resources, such as minerals, coal, oil, and gas, in an environmentally-sustainable way.

The program educational objectives of the B.S. in geological engineering program are:

- Our graduates use their broad education to serve as the foundation of successful careers in geological engineering and/or related fields in the public or private sectors, and/or graduate education.
- Our graduates possess technical knowledge required to meet the unique challenges of geological engineering problems, especially those germane to cold regions including Alaska.
- Our graduates demonstrate professionalism through clear communication, actively serving the community, teamwork, commitment to ethical standards, and life-long learning.

As America's Arctic University, UAF's Geological and Civil Engineering programs provide training in recognizing and mitigating problems associated with frozen ground, such as frost heaving, thaw settlement, and slope stability in a permafrost environment.

The Geological Engineering program requirements can be found [here](#). Additionally, the current road map (a document which outlines the typical path taken by students in achieving a four-year degree) and flow chart for the progression of courses can be found at the end of this document.

3.4. CGEE UNDERGRADUATE ADVISORS

Academic advising is a vital part of a student's experience at UAF. In fact, academic advising is so important that UAF requires all degree students to meet with their academic advisor at least once a semester, including the summer semester, before students can schedule courses. An academic advisor can help students to develop an educational plan encompassing a student's academic and career goals, major and/or minor requirements, and help provide a semester-by-semester study plan to ensure timely graduation. Students can also see degree and major requirements through DegreeWorks at UAOnline. More information on academic advising and learning assistance can be found [here](#).

We have several faculty undergraduate advisors in the CGEE department to which you will be assigned during your freshmen year.

Geological Engineering | Dr. Margaret Darrow and Dr. Shishay Kidanu

Civil Engineering | Dr. Il-Sang Ahn, Dr. Dave Barnes, Dr. Nathan Belz, Dr. Nima Farzadnia, Dr. Sveta Stuefer

Students just starting at UAF will most likely meet Joe Alloway, our CEM advisor. Joe will help you get into your first semester of courses. During your first semester, one of the CGEE advisors will contact you to advise you for the rest of their academic career within the department. Although your CGEE advisor will stay constant for your time within the BS degree, a student may request a different faculty advisor within the student's major under extenuating circumstances. You can submit a request for change to the Department Chair. In the event that the Department Chair is the student's advisor, the student may approach one of the other CGEE advisors to make this request.

Students meet with their advisors as part of the registration process each semester to plan the next semester's program with their required program of courses in mind. Designated faculty undergraduate advisors will make sure that their advisees are aware of available meeting times during the period that

spans UAFs pre-registration and registration periods and how to schedule advising appointments. **Your schedule must be reviewed by your advisor before you will be allowed to enroll in courses.**

CGEE advisors will use Nanook Navigator to store advising records. If, for some reason, your regular advisor is not available and the student needs immediate support, you can contact any of the other advisors within CE or GE for help. As a final back-up, you can meet with the college advisor, Joe Alloway, who also will have access to advising documents in Nanook Navigator.

Things to do in advance of advising appointments:

- Check with your advisor to determine how they prefer to schedule advising appointments. Some use Nanook Navigator while others may use different scheduling platforms such as Google Calendar.
- Add courses to your “Cart” before meetings. Note: creating your “wish list” does not place in those classes until you register for them after meeting with and being “pinned” by your advisor. Ensure that your schedule will work. This means, there are no time conflicts and there are not any prerequisite issues.
- Provide your advisor with your course plan (this should include semesters beyond spring 2022) so that they can review it beforehand. Ask your advisor about our handy spreadsheets for keeping track of your course plan! If you are not already using a planning sheet (or something like it), we strongly encourage you to do so.

Some students seek advising from other sources (like athletics, the Honors program, TRIO, or another academic program if double majoring). While we encourage students to seek mentoring and support from whatever sources they choose, the CGEE advisors want their advisees to talk to them first about their academic plans each semester. Students then can go to the Honors program or their athletic advisor, for example, for early pinning.

4. ACADEMIC STANDARDS

In addition to meeting all University academic requirements, CGEE students must maintain a 2.0 GPA overall, and a 2.0 GPA in the major. Many elective and required courses carry the additional requirement that a grade of C- or better be earned in all prerequisites.

Courses numbered 600-699 are graduate courses that may only be taken by undergraduates with a cumulative GPA greater than or equal to 3.0 who have permission from their academic advisor.

4.1. GRADING POLICIES

Letter grades on a scale of A to F are given by faculty at the university. CGEE faculty may assign whole letter grades or may grant plus and minus grades. If you are in doubt as to the grading procedure used in any course, check with the instructor. As per the UAF Catalog:

- A** (including A+ and A-) indicates a thorough mastery of course content and outstanding performance in completion of course requirements.
- B** (including B+ and B-) indicates a high level of acquired knowledge and performance in completion of course requirements.
- C** (including C+ and C-) indicates a satisfactory level of acquired knowledge and performance in completion of course requirements.
- D** (including D+ and D-) indicates a minimal level of acquired knowledge and minimal performance in completion of course requirements. This grade does not satisfy requirements for courses in the major, minor, core or graduate programs.
- F** indicates failure to meet a minimal level of understanding of course content and/or performance in completion of course requirements. All F grades, including those earned in pass/fail courses, are included in the GPA calculations.
- P** Pass — The pass grade indicates satisfactory completion of course requirements at either the undergraduate or graduate level. A pass grade does not affect your GPA but credits earned with pass grades may meet degree requirements and may be used as a measure of satisfactory progress. Satisfactory performance is the equivalent of a C grade (2.0) or better in undergraduate course work and B grade (3.0) or better in graduate courses. The entire class must be graded pass/fail, with the grading system noted in the class schedule.
- CR** Indicates credit was given under the credit/no-credit option.
- DF** Deferred — This designation is for courses such as theses and special projects that require more than one semester to complete. It indicates that course requirements cannot be completed or that institutional equipment breakdown resulted in noncompletion by the end of the semester. Credit may be withheld without penalty until the course requirements are met within an approved time. For undergraduate courses, the grade will automatically change to a W (withdrawn) after two years unless an extension is requested and granted by the registrar.
- AU** Audit — A registration status indicating that you have enrolled for informational instruction only. No academic credit is granted. You may be given a W if you fail to attend a course you are auditing.
- W** Withdrawn — Indicates withdrawal from a course after the first two weeks of a semester.
- I** Incomplete — An incomplete is a temporary grade used to indicate that the student has satisfactorily completed (C (2.0) or better) the majority of work in a course but for personal reasons beyond the student's control, such as sickness, has not been able to complete the course during the regular semester. Normally, an incomplete is assigned in a case when the student is current in the class until at least the last three weeks of the semester or summer session. Negligence or indifference are not acceptable reasons for an I grade. Instructors include a statement of work required of the student to complete the course at the time the I grade is assigned, and a copy of the notice of the incomplete grade will be sent to the dean of the school or college in which the course is given. An incomplete must be made up within one year or it will automatically be changed to an F grade. One year is the longest amount of time allowable for completion of the I. The I grade is not computed in the student's GPA until it has been changed to a regular letter grade by the instructor or until one year has elapsed, at which time it will be computed as an F. A senior cannot graduate with an I grade in either a university or major course requirement. To determine a senior's GPA for honors at graduation, the I grade will be computed as a failing grade.

- NB** No Basis — Instructors may award a No Basis grade if there is insufficient student progress and/or attendance for evaluation to occur. No credit is given, nor is NB calculated in the GPA. This is a permanent grade and may not be used to substitute for the Incomplete. It cannot be removed by later completing outstanding work.
- NS** Not Submitted — Grade not submitted by instructor.
- NG** Non-Graded — Used for sections that are not graded, usually continuing education units (CEUs) or lab sections. Has no impact on GPA calculation.

4.2. STANDARD ASSIGNMENT FORMAT

Effective written communication of calculations and problem solutions is a critically important skill for an engineer. Clarity, order, and documentation allows other engineers to check your work for correctness – better yet, clean and tidy work allows you to revisit your process and solutions after they have escaped your memory. It also allows faculty and graders find and correct technical errors and provide you with the feedback to avoid those mistakes in the future. The following documents the format elements that the CGEE Department has adopted. You should consider these standards to be a requirement for homework submitted in all courses offered in CGEE.

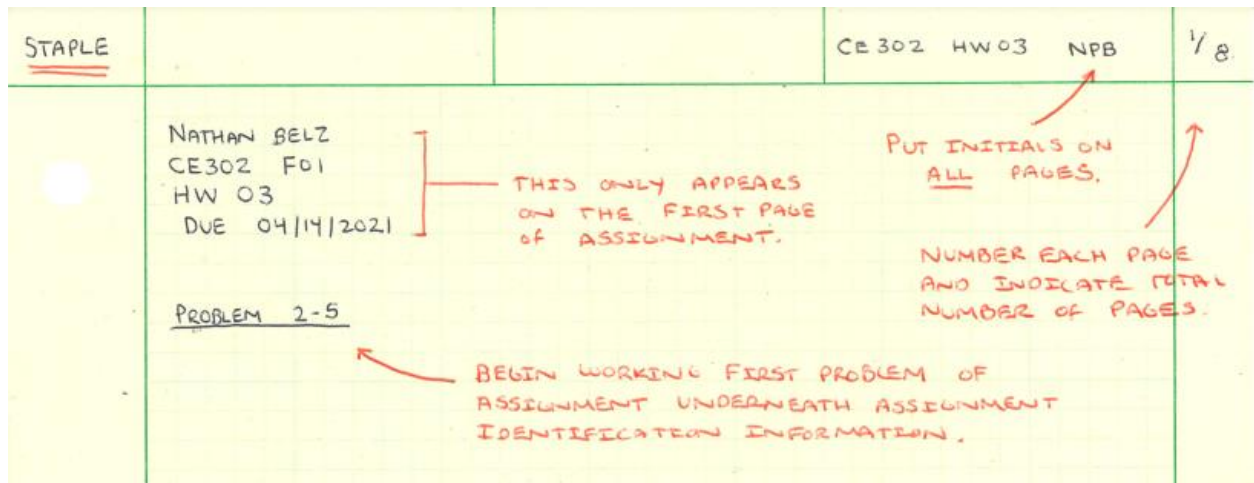
Homework problems and assignments that do not adhere to these standards will have points deducted at the instructor’s discretion. Deduction amounts may vary from 20% to as much as 100% of the value regardless of the correctness of the work.

For exams and quizzes, the instructor will indicate which of the standards and elements must be followed as time constraints may not allow for all of the general formatting requirements to be incorporated. Point value deductions will be made in a similar manner to homework assignments. Note that reports (e.g., technical reports, lab reports, final reports) may have additional or separate formatting requirements and will be clearly defined by the instructor. Failure to adhere to the specified elements will result in grade reductions.

4.2.1. General Appearance

- For assignments being turned in by hand, “engineering paper” (e.g., National 42-182 five-square or equivalent) is required unless otherwise stated by the instructor. Digital assignments may deviate from the requirement.
- All paper used for a single assignment must be of the same size, ruling, and color.
- Use only the front side of the paper. DO NOT write on the back side of the paper.
- Assignments MUST BE STAPLED if they consist of more than a single paper. If the assignment requires more paper than a conventional stapler can handle, use binder clips or similar.
Assignments not stapled or bound will not be accepted.
- Pages used for assignment are NOT to be ripped out of notebooks unless the left edge is smooth.
- Papers are NOT to be folded unless deemed necessary as is in the case of some standard plans and drawings.
- Assignments are to be turned in promptly at the beginning of class on the day the assignment is due. NO EXCEPTIONS.

- Assignments must include the following identifying information unless otherwise stated:
 - a. Name (first and last)
 - b. Course and section
 - c. Assignment information (e.g., HW 08)
 - d. Assignment due date
 - e. Page numbers (in consecutive order) and indicating the total number of pages (e.g., "Page 2 of 8" or similarly "2/8")



- To avoid problems with overlapping letters, all written text must be capitalized. Units and other standard nomenclature (e.g., labeling axes) may use lower case letters as appropriate.
- Provide your initials on each page to the left of the page numbers in case the pages get separated for some reason.
- Start each problem on a new page unless you can concisely fit and display several short problems together on a single page.
- If the assignment requires a large table of figure, orient the sheet of engineering paper such that the holes are located on the "top" edge.

4.2.2. Assignment Content

- The work you hand in for your assignments is a form of engineering communication. Ultimately, you are responsible for showing the instructor your comprehension of the material. This requires that you clearly show your analysis, results, conclusions, and recommendations.
- ALL of your work MUS BE legible and neat – meaning that the writing must be dark enough and of a sufficient size that it can be read.
- Work can be done in either pen or pencil but strike outs (e.g., $2+2=5$), erasures that can still be seen, and white out and not acceptable.
- Straight lines MUST BE drawn with a ruler or straight edge; circles and other curved shapes should be drawn with templates or other instruments (e.g., compass) as appropriate.
- Final answers must be clearly identified by either boxing or underlining the result twice.
- Final answers must have symbols, values, and units where appropriate

e.g., $u_b = 25 \text{ mph}$

4.2.3. Accuracy and Precision

The following general guidelines should be used when completing “standard” homework calculations:

- Carry all significant figures during calculations as to avoid errors that may result from rounding or truncation. To aid in this, consider storing intermediate calculations in your calculator’s memory rather than reentering a value that was written down with a lower precision value (e.g., $D = 8/12 = 0.666666666\dots$ vs. $D = 0.66$ vs. $D = 0.67$)
- When you must report intermediate calculations or values, avoid reporting excessive significant figures (generally four or five is appropriate) even though the higher precision value may have been used in the process.
- Physical constants, molecular weights, conversion factors, and the like should be reported and entered into calculations using four to five significant figures.
- Final answers should be reported with no more than 0.1% accuracy (i.e., three or four significant figures) unless specified otherwise.

Three Significant Figures	Four Significant Figures
279	3.142
2.79	314.2
0.0279	0.0003142
2.79×10^{-5}	3.142×10^6

4.2.4. Problem Solving Methodology

Using the following standardized approach to the problem solving process allows one to work their way to a solution with the least amount of effort. Furthermore, following this approach aids faculty and teaching assistants in the grading process – that is, one can easily follow your method, find your solution, and provide comments and corrections as necessary.

Here, we require a process known as the “Given-Find-Solution-Answer” method. The GFSA method is widely used by engineering departments (and practicing engineers!) to overcome the memorization, rote procedures and “calculator gymnastics” that seem to plague many students. Note that some courses may utilize slight variations on the GFSA method, but the same general principles apply.

Given

In the Given section, restate significant and relevant information from the problem statement. Do not simply repeat the entire problem statement. This is your opportunity to illustrate that you understand the information that will be important for the executing the Solution. If a sketch or schematic is provided, include your own rendition only if it is need to clarify or understand the problem statement.

Find

Here, you state the unknowns – the elements, variables, and the like that you are trying to Find. Assign a symbolic representation for each variable you wish to find (e.g., Find the distance required to stop if traveling and an initial speed of 35 mph, D_b).

Solution

State any assumptions used to achieve the Solution. Use nomenclature that matches the industry standards. If necessary, list physical properties and any other relevant data being sure to state and reference your sources properly. Similarly, reference any tables and figures used to determine relevant properties and values.

- Write out equations necessary for solving the problem.
- Simplify equations algebraically when appropriate.
- DO NOT substitute values into equations until the equation is solved for the variable that you are interested in.
- Once the equation is arranged appropriately to solve for the variable of interest, substitute known values for the symbolic variables.
- Complete equations – that is, solve for unknown quantities.
- Be sure to work through the problem in the unit system given or specified. DO NOT convert back and forth between unit systems unnecessarily (e.g., km/hr → mi/hr → km/hr)
- Single underline any major intermediate answers that are important for the final part of the solution.

Answer

After your calculations are complete, highlight your answer by using a “box” or double underling. Be sure to include the variable symbol, answer, and units in your answer. Provide reflection and comments if necessary. That is, in some cases a single value may not be sufficient and you may need to provide context to that value and the implications thereof. You might ask yourself: *What does this solution mean? Is this value reasonable? Is there a particular goal that can or cannot be achieved knowing this answer?*

4.2.5. Graphs, Plots, and Figures

The major elements of a graph/plot include the elements below. Two example plots are also shown for reference.

- Axes values and labels including units.
- Gridlines where appropriate to help the reader interpret values.
- Data points are represented a circles, squares, triangles (and the like) if they are *measured* values. DO NOT connect measured data points with “dot-to-dot” lines. Use different symbols when more than one series are presented on the same graph/plot (see Figure 1).
- Theoretical lines and regression lines are to be plotted as smooth curves or straight lines (see Figure 2) – in this case, you have the option of showing or not showing calculated points used to draw the curve.

Other key elements and characteristics to consider:

- Use appropriate axes (e.g., arithmetic, semilog, log-log, etc.) so that the reader can intuit accurate data from the graph. Typically this will result in a curve that is as “straight” as possible.
- Use graphing software such as MS Excel or comparable whenever possible. If asked to produce hand-drawn graphs, you MUST USE a straight edge and appropriate graph or engineering paper to ensure that axes are to scale. Freehand curves ARE NOT allowed.

- Label graphs and figures appropriately. This means you must provide both a figure number and a descriptive title centered underneath the figure.

Example

Figure 1. Stress-strain curve for heat-treated aluminum specimen (appropriate) ☺

Figure 1. Stress-strain of aluminum (inappropriate) ☹

- Use citations and follow the reference formatting guidelines if using sources external of the assignment for figures and graphical information.

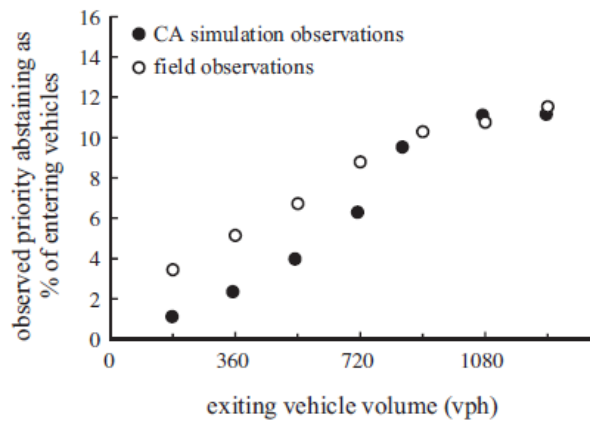


Figure 1. Observed percentages related to conflicting traffic volume for priority abstaining behavior at single-lane roundabouts

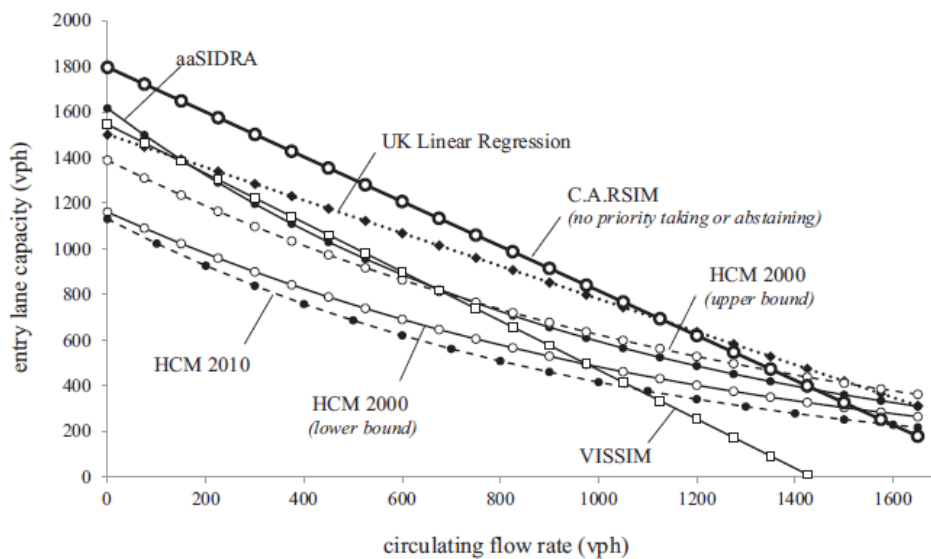


Figure 2. Comparison of capacity estimates for single-lane roundabout models using default parameters

4.2.6. Tables

The major elements of a typical table are shown in the following example:

- Label tables appropriately. This means you must provide both a table number and a *descriptive title* centered above the table.

Example

Table 1. Demographic characteristics of travel survey participants (appropriate) ☺

Table 1. Survey results (inappropriate) ☹

- The body of the table can be delimited by horizontal lines that can be bold or double-line if necessary. Tables NEVER have vertical lines to delimit the left and right edges of the table.
- The body is divided into rows and columns. Columns will *always* have headings with a verbal description of the quantity and its units. In some cases, rows will also have “headings”.
- Column and row headings should be separated from the tabulated quantities by solid lines. Vertical lines may be deleted if they make the table too busy or impede comprehension of the table.
- In general, column headings and column data should be centered in the cell. If the data include a decimal point, values should be aligned on the decimal point.

TABLE 2 Statistical Results of Noncompliant Behavior by Time Since Roundabout Construction

Time Since Construction	Priority Taking		Nonpriority Taking		Priority Abstaining		Nonpriority Abstaining	
	<i>N</i>	Percentage	<i>N</i>	Percentage	<i>N</i>	Percentage	<i>N</i>	Percentage
<5 years	139	2.1	6,502	97.9	599	9.0	6,042	91.0
≥5 years	195	2.2	8,738	97.8	508	5.7	8,425	94.3

4.2.7. References

You may think that engineering is all about math and physics, but engineers write a lot of reports! It is imperative to give credit to your sources. It demonstrates to your reader that you have done your homework and know what the relevant sources of information are on your topic at hand, which increases your credibility (or your report Street Cred). It also acknowledges the work of others. A person who copies words from a paper on the internet and pastes them into his or her report without acknowledging the source is essentially stealing that work. This is called plagiarism; it is unethical and can get you in a lot of trouble both professionally and here at UAF. Be sure to cite all of your sources, paraphrase, or quote as needed! If you are unsure how to do this, refer to your LS101 Library Science notes, or ask any of your professors for help.

The CGEE department adopted the American Society of Civil Engineers (ASCE) journal guidelines for formatting references and citations (ASCE 2019). Did you see that? The “(ASCE 2019)” is an example of an in-text citation for one author. The following are examples for two authors, and three or more authors (e.g., Truman and Gonzalez 2006; or Truman et al. 2007). The full reference for the ASCE (2019) citation is listed at the end of this section. Your reports should include a reference section, in which you include all of your referenced work in alphabetical order by the last name of the first author. The following are examples of formatting for different types of references, all taken from ASCE (2019). Please note that it is

good practice to have a hanging indent for references that take several lines. For more details, please visit <https://ascelibrary.org/doi/book/10.1061/9780784479018>.

Books:

Evans, G. M., and J. C. Furlong. 2003. *Environmental Biotechnology: Theory and Applications*. Chichester, UK: Wiley.

Building Codes and Provisions:

ACI (American Concrete Institute). 1989. *Building Code Requirement for Reinforced Concrete*. ACI 318-89. Farmington Hills, MI: ACI.

Data Sets:

Ansolabehere, S., M. Palmer, and A. Lee. 2014. "Precinct-level election data. V1." *Harvard Election Data Archive*. Accessed January 20, 2017. <https://doi.org/10.7910/DVN/YN4TLR>.

Websites:

Arizona Dept. of Commerce. 2005. "Community profile: Hualapai Indian Reservation." Accessed March 17, 2014. <http://www.azcommerce.com/doclib/commune/hualapai.pdf>.

Foucher, J. 2017. "The role of construction companies before, during, and after disaster." *ConstructConnect* (blog). Accessed October 11, 2017. <https://www.constructconnect.com/blog/operating-insights/role-construction-companiesdisaster/>.

Journal Articles:

Beskos, D. E. 1987. "Boundary element methods in dynamic analysis." *Appl. Mech. Rev.*, 40 (1), 1-23. <https://doi.org/10.1115/1.3149529>.

Irish, J. L., and D. T. Resio. 2013. "Method for estimating future hurricane flood probabilities and associated uncertainty." *J. Waterway, Port, Coastal, Ocean Eng.* 139(2): 0401301. [https://doi.org/10.1061/\(ASCE\)WW.1943-5460.0000157](https://doi.org/10.1061/(ASCE)WW.1943-5460.0000157).

Foreign Journals:

Glock, D. 1977. "Überkritisches Verhalten eines starr ummautelten Kreisrohres bei Wasserdruck von aussen und Tempertudehnung" [Critical behavior of liners of rigid pipeline under external water pressure and thermal expansion]. [In German.] *Der Stahlbau* 7, 212-217.

ASCE Technical Reports:

Technical Committee for the Underground Technology Research Council. 2007. *Geotechnical Baseline Reports for Underground Construction: Suggested Guidelines*. Reston, VA: ASCE.

Maps:

Brown, R. J. E., cartographer. 1967. *Permafrost in Canada*. Map 1246A. Ottawa: Geological Survey of Canada.

Smith, R. L., R. A. Bailey, and C. A. Ross, cartographers. 1970. *Geologic map of the Jemez Mountains, New Mexico*. USGS Misc. Invest. Map, I-571. Washington, DC: USGS.

Newspaper Articles:

Mossberg, W. S. 1993. "Word isn't perfect but new WordPerfect is too much for words." *Wall Street Journal*, December 2, 1993.

Conference Proceedings:

Eshenaur, S. R., J. M. Kulicki, D. R. Mertz. 1991. "Retrofitting distortion-induced fatigue cracking of noncomposite steel girder-floorbeam-stringer bridges." In *Proc., 8th Annual Int. Bridge Conf.*, 380-388. Pittsburgh: Engineer's Society of Western Pennsylvania.

Unpublished reports: These should be cited in the text using the following format:
(author name(s), name of report, unpublished report)

Source: ASCE (American Society of Civil Engineers). (2019). Publishing in ASCE Journals: A Guide for Authors: ASCE Publications.

6. CAMPUS RESOURCES

6.1. ENGLISH DEPARTMENT WRITING CENTER

The Writing Center is a student-staffed tutoring service focused on building the writing skills of the UAF learning community. We are still assisting student writers during the [COVID-19 response](#), although we've moved our services to virtual formats. Using the calendar and form below, you can schedule a meeting with a Writing Center tutor over the phone, Google Hangouts or Zoom.

Due to changes associated with our new virtual format, all tutoring sessions are now an hour long. You can view our tutor profiles and each tutor's availability using the button below. Because we're working remotely, we unfortunately cannot be reached by phone. If you need assistance, please email us at uaf-writing-center@alaska.edu.

To make an appointment with a Writing Center tutor:

1. Using the "Appointment Calendar" panel below, review the available time slots.
2. In the "Schedule an Appointment" panel, click "Add" and select your preferred time. (Please do not book multiple back-to-back appointments.)
3. Complete the required fields and press "Submit."
4. Either upload your draft in the appointment form or email it to us (uaf-writing-center@alaska.edu). Please send your draft **at least 30 minutes prior** to your appointment time. Finally, please limit your document to a maximum of 10-12 pages. If you have a longer draft that you would like assistance with (such as a thesis or dissertation), contact us via email so that we can discuss the best way to help you.

6.2. ALASKA.EDU EMAIL AND COMMUNICATION

UAF uses email to communicate with students about many important matters. Email is often the only way some information is distributed, so it's important you check your email frequently and read messages sent to you from the university. For example, if you are waitlisted for a class, an email will be sent to you when a seat becomes available. If you don't act on the email within a specified time frame, you risk losing that seat to the next student on the waitlist.

The university automatically assigns each student an official University of Alaska email account. If you prefer to use another email account, rather than your university-generated one, there are three steps to take to ensure you get all official communications:

1. Log in to [UAOnline](#) and enter or update your preferred email address under the "Personal Information" menu.
2. Log in to your [University of Alaska email account](#) and set up a forward to whichever account you prefer.
3. When switching active email accounts, repeat steps 1 and 2 to ensure your preferred email is always up-to-date.

Although you are able to indicate a preferred email address in UAOnline, many faculty and departments at UAF will communicate with you only through your alaska.edu address. You are responsible for knowing — and when appropriate, acting on — the contents of all university communications sent to your university-generated email address.

6.3. MATH AND STATISTICS ADVISING

The Math and Stat Tutoring Lab provides flexible-hour assistance six days a week to students enrolled in mathematics and statistics courses. The lab is coordinated by faculty, and services are provided by students. For more information, contact the Math Department at 907-474-5427 or visit <https://www.uaf.edu/dms/mathlab/1on1-online-tutoring/>.

To schedule an appointment go to <http://fairbanks.go-redrock.com>

Students will need their UA credentials to log into the site. If you do not have access or receive an error message please email uafmathstatlab@gmail.com with your name and the name and section of the math/stat course for which you are registered.

6.4. STUDENT SUPPORT SERVICES

Student Support Services gives students opportunities for academic development, helps them meet college requirements and motivates them to complete their degree program. SSS addresses the unique challenges faced by students from non-college-going and limited-income backgrounds, and supports students experiencing a documented disability by helping them take advantage of academic support resources at UAF. The program is primarily funded by a TRiO grant from the U.S. Department of Education, as well as additional institutional support.

Services include comprehensive advising, tutoring and peer coaching, free printing, first-year learning communities, academic and STEM mentoring, cultural and social engagement, laptop and media loans, and a supportive environment. Eligible incoming local freshmen are encouraged to apply to the Emerging Scholars Academy bridge program held every fall.

All services are free to eligible students. The program is staffed with certified student tutors.

To receive SSS program services, a student must have an academic need and meet one or more of the following criteria:

- be financially limited according to federal criteria,
- be a first-generation college student (meaning neither parent has earned a bachelor's degree), or
- have a documented physical or learning disability.

Participants must also be U.S. citizens or permanent residents, be enrolled in at least 9 credit hours and must be admitted to and pursuing a bachelor's degree from UAF.

For information, visit Student Support Services in 514 Gruening, call [907-474-6844](tel:907-474-6844), email trio.sss@alaska.edu or visit the [Student Support Services website](#) for an application.

6.5. LIBRARIES

UAF has two libraries on the Fairbanks campus and libraries on three rural campuses. The Elmer E. Rasmuson Library, on the Fairbanks campus, is the largest academic library in the state, with more than a million volumes. The Keith B. Mather Library, also on the Fairbanks campus, holds collections in the geological and biological sciences and is Alaska's U.S. Patent and Trademark Office depository. Both libraries offer wireless networking, public computer terminals, and designated quiet study spaces with natural lighting. Rasmuson Library also has group study rooms and a secure 24-hour study space with a student computer lab.

The Rasmuson and Mather libraries provide extensive reference and instructional services for students. Library faculty and staff help students conduct library research using print materials and online databases and collections. The library information and research course, [LS F101X](#), is a required course for bachelor's and associate degrees and gives students an introduction to effective methods of identifying, locating and evaluating information resources.

Get more Rasmuson Library information at [907-474-7481](tel:907-474-7481), AskRasmusonLibrary@uaf.libanswers.com or at the [Rasmuson Library's website](#).

6.6. COMPUTERS AND COMPUTING FACILITIES

The ability to use computers for normal class work is expected in all engineering classes above the F100 level. The Office of Information Technology operates Tech Central in the Bunnell Building on the Fairbanks campus, where students can get free help with their laptops and other devices.

Another popular stop is the OIT service desk, your gateway to many of the other services OIT offers UAF students, faculty and staff. The service desk has two walk-up locations — 231 Bunnell and 102 Butrovich — and can be contacted by calling [907-450-8300](tel:907-450-8300) or [800-478-8226](tel:800-478-8226), emailing helpdesk@alaska.edu, or visiting OIT [online](#).

Wireless internet is available in most public areas and in all buildings on the Fairbanks campus. The residence halls can also connect via wired access.

There are two open computer labs located in Duckering (Room 244 and 531) for general CGEE student use. There are two additional student computer labs, one in 404 Rasmuson and another 110 Moore-Bartlett-Skarland. There's also the Nook, in Bunnell 319, a collaborative space that offers a variety of seating options with power outlets, virtual computer stations, wired and wireless network access for student devices, mobile printing, and conference tables where students can share content on their devices with others on a large screen. ELIF has several break out and study spaces distributed across the building.

8. STUDENT ACTIVITIES

There are a number of opportunities to get involved with co-curricular and extra-curricular activities within the CGEE Department. Joining a student club or organizations is a great way to meet new people, network, and explore shared interests. Some even offer opportunities to participate in [competitions](#) where you can apply the knowledge you acquired in the classroom to a practical setting.

UAF has over [100 active student organizations](#) to choose from. The following list is a selection of CGEE-related clubs and organizations that may be of interest to you.

8.1. ASCE/AGC

The UAF chapter of the American Society of Civil Engineers (ASCE) and Associated General Contractors (AGC) is made up of student engineers who want to be actively involved in their education and community. ASCE and AGC has annual projects and competitions such as Ice Arch, Concrete Canoe, and Steel Bridge. These student groups also host informational speakers, has a large part in activities related to Engineers Week (eWeek), and coordinate study and review session for students taking the FE Exam.

8.2. AEG

AEG is the Association of Environmental and Engineering Geologists. Here at UAF, we have a strong student chapter of AEG. This society facilitates presentations from engineering and geology professionals, provides information on internships, organizes field trips around Alaska, and sometimes hosts Bad Geology Movie night. The national organization has an annual meeting every September. The Geological Engineering program helps to fund students to attend and present at the national meeting. For more information about the national organization, check out www.aegweb.org. Write to aeg.uaf@gmail.com to contact our UAF student chapter.

8.3. CHI EPSILON

Chi Epsilon is the National Civil Engineering Honor Society in the United States. We honor engineering students who have exemplified the principles of "Scholarship, Character, Practicality, and Sociability" in the civil engineering profession.

Students and professionals are selected to become members based on recognition of their scholarship, character, practicality and sociability, considered by Chi Epsilon to be the four primary traits of a successful engineer. For student members, scholarship is determined by being in the top third of their junior or senior class. Members of Chi Epsilon are considered top graduates and are highly sought by civil engineering employers.

8.4. TAU BETA PI

Tau Beta Pi (TBP) is the only engineering honor society that represents all engineering disciplines, and is the second-oldest honor society in the United States (founded in 1885). Members of TBP are selected based on their "distinguished scholarship and exemplary character." The Alaska Alpha (AK A) chapter was established at UAF in 1974, and is still going strong! Each semester, AK A members identify and initiate

students in the top eighth of the Junior class and the top fifth of the Senior class. Our chapter helps with college student leadership, and provides service to the greater Fairbanks community through volunteering in a variety of activities. Keep your grades up, and you too can become a member! Take a look at tbp.org for more information about the honor society.

8.5. SWE

UAF has a student chapter of the Society of Women Engineers (SWE). SWE is a non-profit, educational, service organization dedicated to making known the need for women engineers and encouraging young women to consider an engineering education. UAF SWE connects students, faculty, and professionals of both genders with an interest in supporting women in engineering come together to form a supportive atmosphere. Activities and regular meetings occur throughout the year, and include events such as organizing Engineering Connections dinners, helping with Women in Science and Technology Day for the Girl Scouts, and holding a forum about women in a man's world. For more information about joining the University of Alaska Fairbanks Society of Women Engineers' Student Chapter, please contact uafsw@gmail.com.

9. SCHOLARSHIPS

There is money out there, you just have to apply for it! Check out this link for all of the scholarships available within the College of Engineering and Mines: <https://www.uaf.edu/cem/resources/scholarships.php> If you scroll down the page, you can find scholarships specific to Civil and Geological Engineering. The annual application deadline for scholarships in the following academic year is February 15. Go to this link to find out more about how to apply: <https://uaf.edu/finaid/scholarships.php>

10. ENGINEERING LICENSURE AND THE FE EXAM

All 50 states and most countries regulate the practice of engineering in order to protect the public health and safety. States regulate the practice of engineering by granting only Professional Engineers (PEs) the authority to sign and seal engineering plans and offer their services to the public. To use the PE seal, engineers must complete several steps to ensure their competency. They must:

- Earn a four-year degree in engineering from an accredited engineering program;
- Pass the Fundamentals of Engineering (FE) exam;
- Complete four years of progressive engineering experience under a PE (or five years for Geological Engineering graduates in Alaska, as the State of Alaska has no PE exam);
- Pass the Principles and Practice of Engineering (PE) exam.

Many engineering employers, both private and government, require a PE for promotion above entry-level positions. Besides demonstrating to employers and the public an engineer's competence, obtaining the PE is a source of pride – it is the mark of a learned profession. See:

<https://www.nspe.org/resources/licensure/why-get-licensed>

Taking the FE exam is a graduation requirement of our UAF engineering programs. The UAF pass-rate for the FE is above the national average most years. Most students typically take the day-long exam in their last semester, although they may take it earlier, if they desire. For example, Geological Engineering students may take it as early as the spring semester of their junior year. The exam tests both general knowledge of mathematics, chemistry, physics, and engineering science, and more specialized knowledge about each discipline, such as civil engineering. As there is no discipline-specific exam for Geological Engineering, GE students take the “other disciplines” exam. The academic departments and the student societies frequently offer review classes and other helps for students who would like help preparing for the FE.

For more information, go to: <https://ncees.org/engineering/fe/>

The FE Exam is typically administered through UAF eCampus Exam Services. As a national testing center, eCampus Exam Services administers paper-and-pencil and computer-based exams. The office advises UAF students, prospective students and the community on national testing matters for college admissions and placement and for career and professional certification. eCampus Exam Services also coordinates credit by examination for local tests, for the College-Level Examination Program and can perform private proctoring. For more information and registration materials, visit eCampus Exam Services in 122 Bunnell Building, call 907-474-5277, email uaf-testing@alaska.edu or visit eCampus Exam Services [online](#).

11. APPLYING FOR GRADUATION

Woohoo! You are nearly there! Work closely with your academic advisor to ensure that all of your course requirements have been met. To apply for graduation, go to this web page: <https://www.uaf.edu/reg/grad/application.php>. The deadlines for graduation application are February 15 for spring semester, July 15 for summer semester, and October 15 for fall semester. The application fee is \$50.

12. TITLE IX AND NON-DISCRIMINATION NOTICE

The University of Alaska is an affirmative action/equal opportunity employer and educational institution. The University of Alaska does not discriminate on the basis of race, religion, color, national origin, citizenship, age, sex, physical or mental disability, status as a protected veteran, marital status, changes in marital status, pregnancy, childbirth or related medical conditions, parenthood, sexual orientation, gender identity, political affiliation or belief, genetic information, or other legally protected status. The University's commitment to nondiscrimination, including against sex discrimination, applies to students, employees, and applicants for admission and employment. Contact information, applicable laws, and complaint procedures are included on UA's statement of nondiscrimination available at www.alaska.edu/nondiscrimination.

The following person has been designated to handle inquiries regarding the nondiscrimination policies:

Margo Griffith
Director, ADA/504 Coordinator, Department of Equity and Compliance
1692 Tok Lane, 3rd Floor Constitution Hall

PO Box 756910

Fairbanks, AK 99775-6910

Phone: 907-474-7300

E-mail: uaf-deo@alaska.edu

Websites: <https://www.uaf.edu/equity> (nondiscrimination), <https://uaf.edu/titleix/> (Title IX)

13. FREQUENTLY ASKED QUESTIONS

1) What is a Living Learning Community and should I join one?

The purpose of a Living Learning Community (LLC) is to connect students who are in similar majors or who have similar interests. There are many LLCs to choose from, including an Engineering LLC, Honors, LLC, among others. If you are planning to live on campus, we recommend you consider joining an LLC to enhance your first year. If you choose an academic LLC, such as engineering, you will have the advantage of sharing a living space with many of your classmates and will have an easy time finding study-buddies for classes such as Engineering Science, Chemistry, Physics, and Math. If you choose a non-academic LLC, such as Outdoor Adventures, you will be immediately connected with a social circle of students who have similar interests to you and with whom you will likely enjoy spending time. In either case, there are big advantages, and we encourage you to consider joining!

2) How do I get scholarships after my first year?

You should plan to apply for scholarships every year that you are planning to attend UAF. You can learn more online at <https://uaf.edu/financialaid/scholarships.php>. Scholarships available within CEM are listed here: <https://www.uaf.edu/cem/resources/scholarships.php>. Additionally, many scholarships, such as the Alaska Performance Scholarship and the UA Scholars award, have certain requirements, such as a minimum GPA or a certain number of completed credits per year, for continued payment. Make sure that you're in line with those expectations every year. If you have questions, please contact the financial aid office. They're more than happy to assist you!

3) Should I take summer classes?

In a word, yes! If you have the ability to take summer classes, it is a very good idea to do so, especially in your first couple of years in CEM. While it's true that there aren't generally very many Engineering courses offered in the summer, almost all of the core requirements, including math and science, are offered in the summer. Taking just one or two classes every summer can help keep your skills sharp for the next academic year, and can also help you to either graduate early or to lighten your workload during the August-May academic year.

4) Should I join a student club or organization?

Again, the answer is yes! Remember that when you are attending college you are training for a career in your field, so getting some hands-on experience through participation in things like student clubs and competitions is a really good idea. Participation in such groups brings three distinct advantages: 1) It will provide an introduction to professional networking within your field, which is a skill that will help you secure internships and jobs further down the line; 2) it will provide a circle that can provide both social and academic support (if you're struggling in a class, the odds are good that one of the more experienced students in your club has some tips that might help!); and 3) participation in student activities,

particularly competitions, can give you a taste for the potential of your field, and will help you to be sure this is a good choice for you.

5) How do I stay motivated for my classes, especially in the winter?

The winters in Fairbanks are dark and it does get cold here, so they can be rough for some students. For many students, especially those who are not from Fairbanks or from Alaska, this can be particularly pronounced. Sometimes the issue is a vitamin D deficiency. We usually get Vitamin D from sunlight, but there's a limited amount of that in winter in Fairbanks. To combat this, something like a full spectrum lamp can really help. About 15 minutes bathed in such a light can do wonders for winter energy levels, but be careful not to use it for too long, as an excess amount of light can lead to some discomfort (heightened heart rate, sweating, etc.). Another good way to be successful in the winter months is to keep active, both socially and physically. Spending time with friends and doing the things you enjoy doing, whether in-person or virtually, can be very beneficial for your motivation. Just be careful to not spend all your time doing your favorite things, because you still have to have the energy necessary for your classes and homework!

BACHELOR OF SCIENCE IN GEOLOGICAL ENGINEERING (2021-2022 Catalog Year)

First Year: Fall

GE F101 – Intro to Geological Engr.	1
MATH F251X – Calculus I	4
CHEM F105X – General Chemistry	4
MIN F202 or CE F112 Surveying	2 or 3
WRTG F111X – Intro. to Acad. Writing	3
LS F101X – Library Info. & Research	1
	<u>15 or 16</u>

Second Year: Fall

MATH F253X – Calculus III	4
GEOS F213 – Mineralogy	4
PHYS F211X – General Physics	4
GER A, H, SS, E (1 of 6)	3
	<u>15</u>

Third Year: Fall

ES F331 – Mechanics of Materials	3
GE F326 – Intro. to Geotech. & Fndts.	4
GEOS F320 – Sedimentology for GE's	3
MIN F390 or STAT F200** Statistics/Econ	3
ES F346 – Intro to Thermodynamics	3
	<u>16</u>

Summer: After Third Year

GE F381 – Field Methods and Applied Design I	2
GE F382 – Field Methods and Applied Design II	2
	<u>4</u>

Fourth Year: Fall

GE F405 – Engr. and Envr. Geophysics	3
GE F420 – Groundwater Engineering	3
Technical Elective	3
((**ESM F450 (if choosing STAT F200)	3))
GER A, H, SS, E (2 of 6)	3
GER A, H, SS, E (3 of 6)	3
	<u>15 or 18</u>

First Year: Spring

GE F261 – General Geology for Engr.	3
MATH F252X – Calculus II	4
CHEM F106X – General Chemistry	4
COJO F1X1X – Oral Comm.*	3
WRTG F21XX –Writing*	3
	<u>17</u>

Second Year: Spring

MATH F302 – Differential Eqn.	3
ES F208 – Mechanics	4
PHYS F212X – General Physics	4
GEOS F214 – Petrology & Petrography	4
	<u>15</u>

Third Year: Spring

ES F341 – Fluid Mechanics	4
GEOS F314 – Structural Geology	4
MIN F370 – Rock Mechanics	3
GE F375 – Terrain Analysis and GIS	3
	<u>14</u>

Fourth Year: Spring

GE F480 – Senior Design	3
Technical Elective	3
GER A, H, SS, E (4 of 6)	3
GER A, H, SS, E (5 of 6)	3
GER A, H, SS, E (6 of 6)	3
	<u>15</u>

* Students may choose from a suite of courses to fulfill this requirement.

Students must take the Fundamentals of Engineering Exam in order to graduate.

GER A, H, SS, E: General Education Requirements – Arts, Humanities, Social Science, Ethics

Technical electives: Complete 6 credits from the following technical electives:

GEOTECHNICAL/ARCTIC OPTION

- GE F430 Geomechanical Instrumentation
- GE F440 Slope Stability
- GE F441 Geohazard Analysis
- GE F445 Design of Earth Dams and Emb.
- CE F422 Foundation Engineering
- CE F424 Permafrost Engineering
- CE F401 Arctic Engineering

MINING OPTION

- GE F435 Exploration Design
- MIN F482 Computer-aided Mine Design
- GEOS F332 Ore Deposits and Structure

GIS OPTION

- GE F376 GIS Appl. In Geol. and Envr. Engr.

PETROLEUM OPTION

- PETE F302 Well Logging
- PETE F407 Petroleum Production Engineering
- PETE F426 Drilling Engineering

WATER RESOURCES/ENVR ENGR OPTION

- CE F341 Environmental Engineering
- CE F344 Water Resources Engineering
- CE F442 Environmental Engineering Design
- CE F445 Hydrologic Analysis and Design

STUDENT NAME: _____

ID #: _____

2021-2022 CATALOG
GEOLOGICAL ENGINEERING
B.S. Degree Requirements
Minimum required credits: 126

Students must earn a C- grade (1.7) or better in each course.

GENERAL EDUCATION REQUIREMENTS:
COMMUNICATIONS:

WRTG F111X (3) _____
WRTG F21XX* (3) _____
COJO F1X1X* (3) _____

*ARTS: (3) _____

*HUMANITIES: (3) _____

*SOCIAL SCIENCES: (3) _____

*SOCIAL SCIENCES: (3) _____

*ADDITIONAL A, H, SS: (3) _____

*ETHICS: (3) _____

*Course meeting Alaska Native-themed requirement:

MATHEMATICS:

MATH F251X (4) _____ MATH F252X (4) _____
§MATH F253X (4) _____ §MATH F302 (3) _____

NATURAL SCIENCE:

CHEM F105X (4) _____ CHEM F106X (4) _____
§PHYS F211X (4) _____ §PHYS F212X (4) _____

LIBRARY & INFO. SKILLS:

LS F101X (1) _____

MAJOR REQUIREMENTS

Complete the following program (major) requirements (includes courses indicated with § to the left):

ES F208 (4) _____
ES F331 (3) _____
ES F341 (4) _____
ES F346 (3) _____
GE F101 (1) _____
GE F261 (3) _____
GE F326 (4) _____
GE F375 (3) _____
GE F381 (2) _____ (W)
GE F382 (2) _____ (W)
GE F405 (3) _____
GE F420 (3) _____
GE F480 (3) _____ (W)
GEOS F213 (4) _____
GEOS F214 (4) _____
GEOS F314 (4) _____
GEOS F320 (3) _____
MIN F202 (2) _____ or CE F112 (3) _____
MIN 370 (3) _____
MIN 390 (3) _____ or STAT F200 (3) _____
and ESM F450 (3) _____

Technical electives:

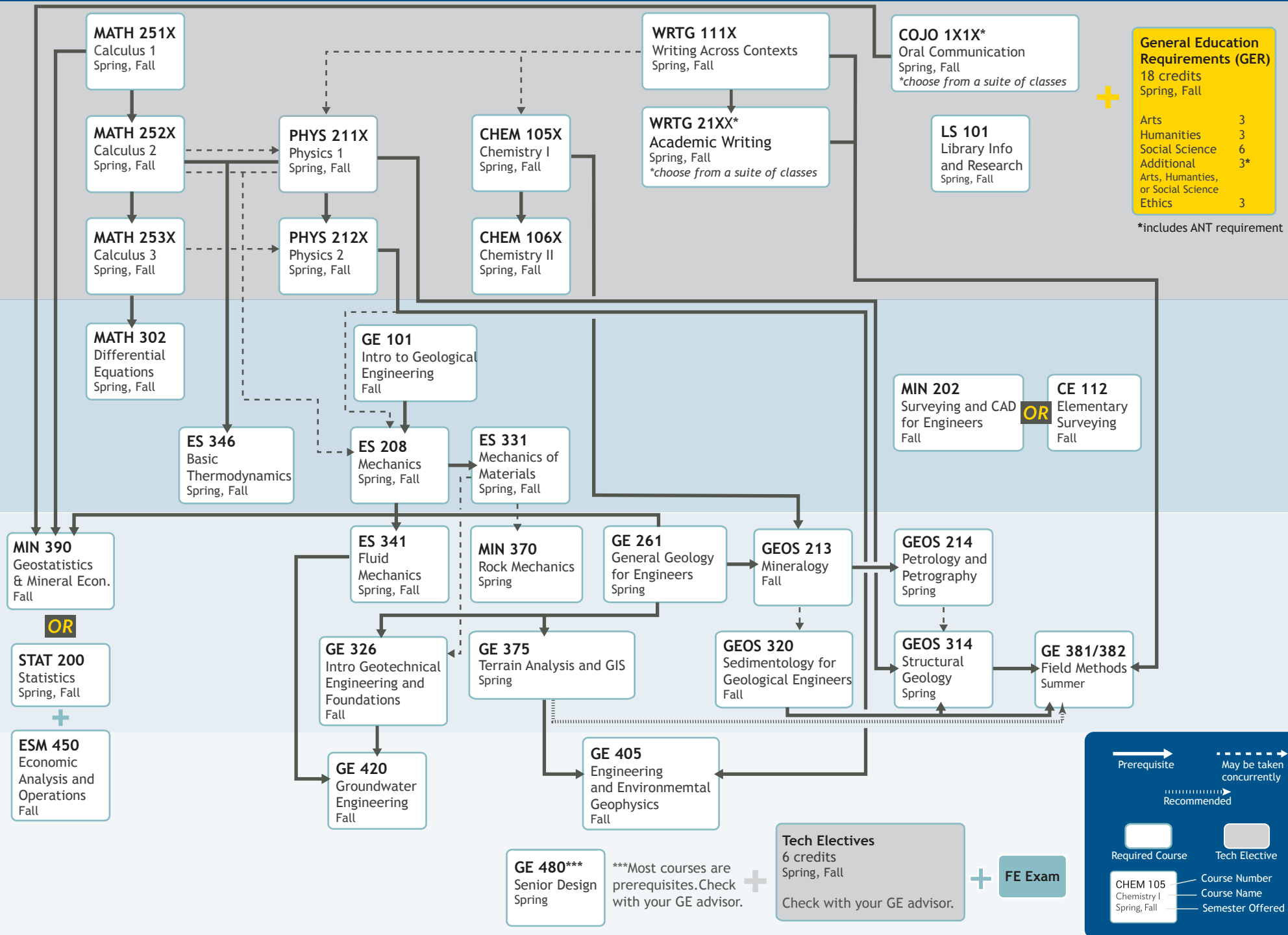
_____ (3) _____ (3) _____

Must take the Fundamentals of Engineering Exam.

EXAM TAKEN: _____

* For a list of allowable classes, check the UAF catalog or speak with your advisor.

Total minimum credits required for degree: 126



BACHELOR OF SCIENCE IN CIVIL ENGINEERING (2021-2022 Catalog Year)

First Year: Fall

ES F101 – Intro. to Engineering	3
MATH F251X – Calculus I	4
CHEM F105X – General Chemistry	4
MIN F202 or CE F112 – Surveying	2 or 3
WRTG F111X – Intro. to Acad. Writing	3
	<hr/> 16 or 17

First Year: Spring

MATH F252X – Calculus II	4
CHEM F106X – General Chemistry	4
COJO F1X1X – Oral Comm.*	3
WRTG F21XX –Writing*	3
LS F101X – Library Info. & Research	1
	<hr/> 15

Second Year: Fall

MATH F253X – Calculus III	4
PHYS F211X – General Physics	4
DRT F210 – Intermediate CAD	3
ES F201 – Computer Techniques	3
GER A, H, SS, E (1 of 6)	3
	<hr/> 17

Second Year: Spring

MATH F302 – Differential Eqn.	3
PHYS F212X – General Physics	4
ES F208 – Mechanics	4
ES F301 – Engineering Analysis	3
GE F261 – Gen'l Geology for Engr.	3
	<hr/> 17

Third Year: Fall

ES F331 – Mechanics of Materials	3
CE F326 – Intro. to Geotech. & Fndts	4
ES F341 – Fluid Mechanics	4
CE F341 – Environmental Engr.	4
	<hr/> 15

Third Year: Spring

CE F302 – Transportation Engr.	3
CE F331 – Structural Analysis	3
CE F334 – Properties of Materials	3
GER A, H, SS, E (2 of 6)	3
GER A, H, SS, E (3 of 6)	3
	<hr/> 15

Fourth Year: Fall

CE F344 – Water Resources Engr.	3
CE F432 – Steel Design	3
ESM F450 – Economic Analysis & Ops.	3
Technical Elective	3
Technical Elective	3
	<hr/> 15

Fourth Year: Spring

CE F438 – Design of Engr. Systems	3
Technical Elective	3
GER A, H, SS, E (4 of 6)	3
GER A, H, SS, E (5 of 6)	3
GER A, H, SS, E (6 of 6)	3
	<hr/> 15

* Students may choose from a suite of courses to fulfill this requirement.

Students must take the Fundamentals of Engineering Exam in order to graduate.

GER A, H, SS, E: General Education Requirements – Arts, Humanities, Social Science, Ethics

Technical electives: 1) Complete 3 credits from the fields of environmental, construction, or transportation engineering; 2) Complete 6 credits from any of the following areas of emphasis, or as approved by an advisor:

ARCTIC EMPHASIS

CE F401 Arctic Engineering
CE F424 Permafrost Engineering
ME F441 Heat and Mass Transfer

CONSTRUCTION EMPHASIS

CE F451 Constr. Cost Est. and Bid Prep.

ENVIRONMENTAL EMPHASIS

CE F442 Water & Wastewater Trtmt. Design
CE F443 Air Pollution Management
ENVE F446 Biological Unit Processes

GEOTECHNICAL EMPHASIS

CE F422 Foundation Engineering

GE F440 Slope Stability
GE F441 Geohazard Analysis

STRUCTURAL EMPHASIS

CE F433 Reinforced Concrete Design
CE F434 Timber Design

TRANSPORTATION EMPHASIS

CE F405 Design of Highways and Streets
CE F407 Pavement Materials and Design
CE F408 Transportation Safety Analysis

WATER RESOURCES EMPHASIS

CE F445 Hydrologic Analysis and Design
CE F420 Groundwater Engineering

STUDENT NAME: _____

ID #: _____

2021-2022 CATALOG

CIVIL ENGINEERING

B.S. Degree Requirements

Minimum required credits: 125

Students must earn a C- grade (1.7) or better in each course.

GENERAL EDUCATION REQUIREMENTS:

COMMUNICATIONS:

WRTG F111X (3) _____

WRTG F21XX* (3) _____

COJO F1X1X* (3) _____

*ARTS: (3) _____

*HUMANITIES: (3) _____

*SOCIAL SCIENCES: (3) _____

*SOCIAL SCIENCES: (3) _____

*ADDITIONAL A, H, SS: (3) _____

*ETHICS: (3) _____

*Course meeting Alaska Native-themed requirement:

MATHEMATICS:

MATH F251X (4) _____ MATH F252X (4) _____

§MATH F253X (4) _____ §MATH F302 (3) _____

NATURAL SCIENCE:

CHEM F105X (4) _____ CHEM F106X (4) _____

§PHYS F211X (4) _____ §PHYS F212X (4) _____

LIBRARY & INFO. SKILLS:

LS F101X (1) _____

* For a list of allowable classes, check the UAF catalog or speak with your advisor.

MAJOR REQUIREMENTS:

Complete the following program (major) requirements (includes courses indicated with § to the left):

CE F112 (3) _____ or MIN F202 (2) _____

CE F302 (3) _____

CE F326 (4) _____

CE F331 (3) _____

CE F334 (3) _____

CE F341 (4) _____

CE F344 (3) _____

CE F432 (3) _____

CE F438 (3) _____

DRT F210 (3) _____

ES F101 (3) _____

ES F201 (3) _____

ES F208 (4) _____

ES F301 (3) _____

ES F331 (3) _____

ES F341 (4) _____

ESM F450 (3) _____

GE F261 (3) _____

Technical electives:

Envir., Constr., Transp. _____ (3) _____

Two additional technical electives:

_____ (3) _____ (3) _____

Note: Up to two graduate-level engineering courses can serve as technical electives if approved by advisor; the student must be within two semesters of graduation and have at least a 3.0 GPA.

Must take the Fundamentals of Engineering Exam.

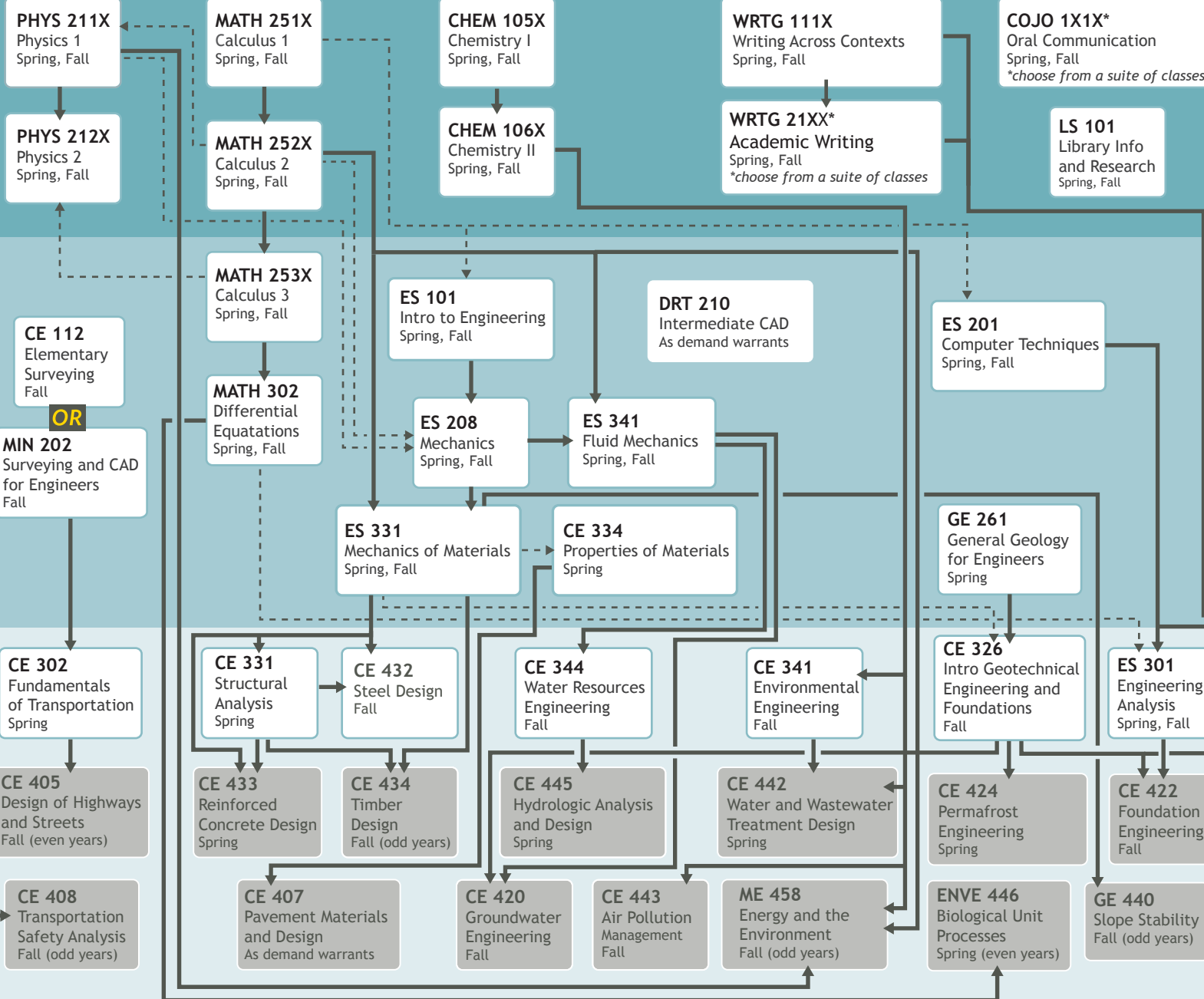
EXAM TAKEN: _____

Total minimum credits required for degree: 125

University core

Engineering Basics

Analysis + Design



General Education Requirements (GER)
18 credits
Spring, Fall

Arts	3
Humanities	3
Social Science	6
Additional Arts, Humanities, or Social Science	3*
Ethics	3

*includes ANT requirement

Prerequisite (solid arrow) May be taken concurrently (dashed arrow)

Required Course (white box) Tech Elective (grey box)

Legend:
 CHEM 105
 Chemistry I
 Spring, Fall

Please note: This is a flowchart, not a timeline!
November 2021

**Has other requirements. Check with your CE advisor.

Complete 9 technical elective credits. Must include 3 credits in the fields of environmental, construction or transportation, and 6 credits of CE, ENVE or ESM courses. Check with your CE advisor.