



CE 320

Numerical Methods for Civil Engineering

Fall 2024

Instructor and Contact Information:

Instructor: Joshua K. Roundy, Ph.D., P.E.

Associate Professor of Civil, Environmental,
and Architectural Engineering
2153 Learned Hall
785-864-3134
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Office Hours:

TR 10:45 to 12:30 PM
You may also send an
email to ask a question
or to schedule a
meeting.

Required Texts and Instructional Materials:

Required Text: No Required Textbook

Recommended Text: Steven Chapra and Raymond Canale (2021). *Numerical Methods for Engineers* (8th edition), McGraw Hill [ISBN: 1260232077](https://www.mhhe.com/9780077126023).

Liu, Yaning and Ökten, Giray (2020). *Numerical First Semester in Numerical Analysis with Python*, [Open Source](#).

Required Software: Assignments will be completed using Excel and Jupyter Notebooks.

Class Time and Location:

Class Time & Location: Tuesday and Thursday 1:00 – 2:15 PM Eaton 1010

Course Description:

This course covers basic concepts of computational methods including; errors and accuracy; matrix operations; eigenvalues and vectors; numerical solution of non-linear equations; iterative methods for solving systems of linear algebraic equations; interpolation and numerical differentiation and integration. This is all done within a Python programming framework as students solve problems within a Civil Engineering context

Instructional Mode and Credit Hours:

This course is offered as an in-person course that fulfills 3 credit hours; Consistent with [KU policy](#) and the federal definition of a credit hour, this means you should expect to spend at least 9 hours a week on this course over the 15-week semester. Most weeks, 3 hours will be instructional time in the classroom (i.e., class meetings) and the remaining time will involve out-of-class work.

Course Learning Outcomes:

Upon successful completion of this course, the student will be able to:

- Demonstrate a fundamental knowledge of applying computer programming and spreadsheets and to solve engineering problems (ABET Outcome 1).
- Demonstrate a fundamental knowledge of the underlining mathematics of numerical methods (ABET Outcome 1).
- Apply the fundamentals of numerical methods to solve problems across the Civil Engineering Discipline (ABET Outcome 6).

Instructor's Attendance/Participation Policy:

The knowledge and skills you will gain in this course are dependent on your participation in class activities and are part of your grade in this course. Because of that, the student is expected to attend all class sessions unless they are ill or have a [University excused absence](#). In the event that the student has to miss class, please talk to the instructor beforehand. If you need to report an extended illness or serious accident, please contact Student Support and Case Management at studentsupport@ku.edu or 785-864-7022.

Course Requirements:

Every student will be required to complete three types of learning assessments in order to demonstrate sufficient learning and retention of the course content and meet the overall learning objectives for the course. There is a total of 1800 points possible through the course across all three learning assessments and each is outlined below:

- **Handouts (HO):** HOs contain problems that should be worked during class and provide a means to prepare students to do the weekly project. HOs are submitted electronically to Canvas. HOs are graded based on completeness and not correctness. There are 10 HOs, each worth 10 points for a total of 100 points.
- **Weekly Projects (WP)** - Weekly projects consist of one or more applied Civil Engineering problem that requires the use of numerical methods. WPs will be completed primarily outside of class time, however, if you complete the HO for the week, you should move on to the WP. WPs are turned in as a PDF in Canvas and should follow the format and structure given in the WP sheet. There are 10 WPs, each worth 50 points for a total of 500 points.
- **Exams (EX):** There are two exams in the course, one midterm and one final exam. The final exam is comprehensive to all the content of the course. Exams consist of two parts. Part 1 test the students fundamental understanding and is combination of conceptual questions and quantitative questions where no notes or computers are allowed. Part 2 consists of one or more problems that must be solved using Excel or Python. Exams are worth 100 points each for a total of 200 points

Classroom Behavior Expectations:

This course aims for ALL students to experience a safe learning environment. It is possible that a student may not agree with everything that is said or discussed in the classroom. Please be courteous

and respectful to everyone and be sure that you make a distinction between criticizing an idea and criticizing the person.

Students who engage in disruptive behavior, including persistent refusal to observe boundaries defined by the instructor regarding inappropriate talking, discussions, and questions in the classroom or laboratory may be subject to discipline for non-academic misconduct for disruption of teaching or academic misconduct, as defined in the [Code of Student Rights and Responsibilities](#) (CSRR). The CSRR also defines potential sanctions for these types of infractions.

Except for in cases of a [University Excused Absence](#), all assignments are due by the day/time indicated in the course calendar.

Special Accreditation Requirements:

This course is designed to meet ABET Student Outcomes: 1,6.

Evaluation Criteria with Grading Scale:

An overall course grade will be assigned based on the following cumulative point system:

Handouts	12 handouts worth 10 points each	120
Weekly Projects	12 weekly projects worth 50 points each	600
Exams	2 exams worth 100 points	200
TOTAL POINTS		920

Letter Grades will be assigned as follows:

Grade	Points
A	860-920
A-	830-859
B+	800-829
B	770-799
B-	740-769

Grade	Percentage Range
C+	700-739
C	670-799
C-	640-669
D	550-639
F	< 550

These thresholds may be adjusted downwards (in the students favor) at the instructor's discretion but will not be adjusted upwards.

At the conclusion of this course, the University will provide an opportunity for you to provide feedback via an online (anonymous) Student Survey of Teaching. The student is strongly encouraged to take advantage of this opportunity to provide feedback. More generally, please feel free to tell the instructor what is working well, and what is not working as well during the semester.

Academic Integrity and Profession Conduct:

[Academic misconduct](#) by a student shall include, but not be limited to, disruption of classes; threatening an instructor or fellow student in an academic setting; giving or receiving of unauthorized aid on examinations or in the preparation of notebooks, themes, reports or other assignments; knowingly misrepresenting the source of any academic work; unauthorized changing of grades; unauthorized use of University approvals or forging of signatures; falsification of

research results; [plagiarizing of another's work](#); violation of regulations or ethical codes for the treatment of human and animal subjects; or otherwise acting dishonestly in research.

The issue of digital plagiarism has raised concerns about ethics, student writing experiences, and academic integrity. The student will be asked to submit some assignments in a digital format so that the paper can be checked against Web pages and databases of existing papers. Although the student may never have engaged in *intentional* plagiarism, many students incorporate sources without citations. This constitutes plagiarism and cannot be treated differently than intentional plagiarism. The [KU Writing Center](#) offers a student writing guide with links to useful information regarding plagiarism and how to avoid it (<http://writing.ku.edu/writing-guides>). If the student is not sure how to use a source in a document, please visit <http://writing.ku.edu/paraphrase-and-summary> or ask the instructor.

Student Access Center:

The Student Access Center (SAC) coordinates academic accommodations and services for all eligible KU students with disabilities. If a student has a disability for which they wish to request accommodations and have not contacted SAC, please do so as soon as possible. SAC is located in 22 Strong Hall and can be reached at [785-864-4064](tel:785-864-4064) (V/TTY). Information about their services can be found at access.ku.edu. Please contact the instructor privately regarding needs in this course.

Other Notes:

If the student has trouble with the reading materials, lectures, or with the pace of the class, please contact the instructor as soon as they are aware of the difficulty. The instructor will work with the student to improve their study skills or to overcome particular obstacles that may interfere with optimal performance in this class. Please talk to the instructor early in the course if there is a suspect or anticipate difficulty in this class!

As a premier international research university, the University of Kansas is committed to an [open, diverse and inclusive learning and working environment](#) that nurtures the growth and development of all. KU holds steadfast in the belief that an array of values, interests, experiences, and intellectual and cultural viewpoints enrich learning and our workplace. The promotion of and support for a diverse and inclusive community of mutual respect require the engagement of the entire university. All members of our campus community must accept the responsibility to demonstrate civility and respect for the dignity of others. Expressions or actions that disparage a person's or group's race, ethnicity, nationality, culture, gender, gender identity, religion, sexual orientation, age, veteran status, or disability are contrary to the mission of the University and are not acceptable in my classroom.

Students shall not be penalized for absence from regularly scheduled class activities that conflict with mandated religious observances ([USRR 2.2.3](#)). In cases of conflicts between class activities and mandated religious observances, the student is responsible for initiating discussion with the instructor to reach a mutually acceptable solution. **If the student anticipates missing class because of a religious observance, please contact the instructor as soon as possible so that alternative arrangements can be made.**

Additional Resources and Policy Information for Students:

In addition to the policies noted above, the following links and resources may be helpful to the student for this course, as well as for others they may be taking. If there are any questions or concerns about any of these policies, statements, or resources, please let the instructor know. In

addition, please visit the [Student Resources website](#) (KU Academic Success) for additional policies and resources.

- [Change of Grade Policy](#) and [USRR, Section 3: Change of Grade](#)
- [Code of Student Rights and Responsibilities](#)
- KU Policy on [Commercial Notetaking](#)
- [KU Statement on Diversity and Inclusion](#)
- [Mandatory Reporting](#) (Civil Rights & Title IX)
- [Nondiscrimination, Equal Opportunity, and Affirmative Action](#)
- [Racial and Ethnic Harassment Policy](#)
- [Sexual Harassment](#)
- [Counseling and Psychological Services](#)
- [Kansas Board of Regents Statement on Freedom of Expression](#)
- [Student Support and Case Management](#)

Course Schedule:

Dates	Topic
Aug 26 - Sep 1	Introduction to Computing
Sep 2 - Sep 8	Approximation and Error
Sep 9 - Sep 15	Visualization and Plotting
Sep 16 - Sep 22	Matrix Algebra (No Class Tuesday)
Sep 23 - Sep 29	Matrix Algebra Continued
Sep 30 - Oct 6	Linear Interpolation
Oct 7 - Oct 13	Root Finding
Oct 14 - Oct 20	No Class (Instructor at Research Meeting)
Oct 21 - Oct 27	Midterm Exam
Oct 28 - Nov 3	Optimization
Nov 4 - Nov 10	Curve Fitting
Nov 11 - Nov 17	Solving Systems of Equations
Nov 18 - Nov 24	Numerical Differentiation
Nov 25 - Dec 1	No Class (Thanksgiving Break)
Dec 2 - Dec 8	Numerical Integration
Dec 9 - Dec 12	Prepare for Final Exam
Fri Dec 20	Final Exam (1:30 - 4:00 p.m.)

The schedule is subject to change throughout the semester.