

CEE 3804 Computer Applications for Civil and Environmental Engineers

COURSE DESCRIPTION

Introduction to computer applications in civil and environmental engineering. Integration of design, data management, computer programming and problem-solving skills with computer tools and techniques. Topics include systems analysis, optimization, database management, computer programming and data structures.

COURSE OBJECTIVES

At the completion of this course, you should be able to:

- 1) Perform linear algebra and matrix operations related to Civil Engineering systems.
- 2) Determine roots of nonlinear equations and solve sets of linear equations
- 3) Construct, interpret and solve simple optimization problems.
- 4) Develop and program simple engineering analyses.
- 5) Create user-defined functions in a programming environment.
- 6) Conduct data analyses with pivot tables.
- 7) Perform numerical integration.
- 8) Combine and quantitatively analyze a global data set, and interpret the differences within individual world views.

COURSE INFORMATION

Lecture 11:15 – 12 :05 MWF (TBD)
 Final Exam TBD (online over zoom)

CRN: 82219

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| Instructor: Dr. Megan Rippy | GTA: TBD |
| 201 OWML mrippy@vt.edu Office hours: by online appointment | |

SYLLABUS

| Week | Dates | Topic |
|------|------------------|---|
| 1 | Aug 22 – 26 | Introduction, Computer Math |
| 2 | Aug 29 – Sept 2 | Excel Review |
| 3 | Sep 5 – 9 | Matrix Operations (Labor Day Mon Sept 5 th - no class) |
| 4 | Sep 12 – 16 | Matrix Operations, VBA macros |
| 5 | Sep 19 – 23 | Integration, Derivatives |
| 6 | Sep 26 – Sept 31 | Roots of nonlinear equations, TEST #1 |
| 7 | Oct 3 – 7 | Goal Seeking, Optimization, Nonlinear Systems (Fall break, Friday Oct 7 th – no class) |
| 8 | Oct 10 – 14 | Lookup and Interpolation (Fall break Fri Oct 16 th – no class) |
| 9 | Oct 17 – 21 | Regression, Pivot Tables |
| 10 | Oct 24 – 28 | Pivot Tables |
| 11 | Oct 31 – Nov 4 | Excel database functions TEST #2 |
| 12 | Nov 7 – 11 | Analysis of large scale global data set |

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| 13 | Nov 14 – 18 | Introduction to Relational Databases |
| 14 | Nov 19 - 27 | Thanksgiving Break |
| 15 | Nov 28 – Dec 2 | Microsoft Access |
| 16 | Dec 5 – 7 | Database Operations and Queries |

COURSE EVALUATION

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| Labs and Homework | 20% |
| Test 1 | 25% |
| Test 2 | 25% |
| Final Exam | 25% |
| Attendance | 5% |

CEE 3804 STUDENT RESPONSIBILITIES

- 1) You will need to use a laptop (with excel, **NOT** google sheets) every day in class. The class is designed for hands-on training. Make sure your battery is charged.
- 2) Keep backups of all submitted work and work in progress. This is your responsibility. Assume that your computer will crash sometime during the course and plan for it.
- 3) Let me know early if you don't understand something. Programming builds on previous material.
- 4) Clearly identify all submitted material. This includes the name of the assignment, your name and email, and the names and emails of any partners.
- 5) Clearly identify who you are and which section you are in when emailing me.
- 6) Timing is tight for most classes. Be ready to start at beginning of class.
- 7) Read the course notes & homework assignments prior to coming to class.
- 8) File naming conventions, especially for group project, must be strictly followed. Failure to do so will cost points. Read the instructions!

TEXTBOOKS AND READING MATERIALS

No textbook is required for the class. A reference for Visual Basic for Applications (VBA) programming might be useful.

The following are available as ebooks through Virginia Tech's library

Excel VBA Programming for Dummies by John Walkenbach

(<http://proquest.safaribooksonline.com.ezproxy.lib.vt.edu/book/programming/vba/9781119077398>)

Numerical Methods for Chemical Engineers using Excel, VBA, and MATLAB by Victor Law

(<http://proquest.safaribooksonline.com.ezproxy.lib.vt.edu/9781466575349>)

Class notes, labs, and homeworks will be posted on the web in Canvas.

We will primarily use MS Excel and MS Access during class. Any version from 2013 on is acceptable. Mac Office users should arrange to run MS Access by mid-November.

HOMEWORK POLICY

Individual homeworks are completed as Canvas quizzes and are due at the assigned date & time. Group assignments (Excel/Access) must be posted to Canvas by the assigned date & time. It is the responsibility of the **entire group** to ensure that the assignment is submitted on time. Late assignments will be penalized 1/2 letter grade for every day they are late. Solutions will be made available through Canvas ~1 week after assignments are due. As long as all students participate, students may work together on homework assignments unless otherwise stated on the homework.

HONOR CODE

Virginia Tech's Office of Undergraduate Academic Integrity (OUAI) has updated the Honor Code policies and procedures, and it is important that you become aware of the updates. The OUAI requires that I include the following statement in this syllabus:

The Undergraduate Honor Code pledge that each member of the university community agrees to abide by states: "As a Hokie, I will conduct myself with honor and integrity at all times. I will not lie, cheat, or steal, nor will I accept the actions of those who do." Students enrolled in this course are responsible for abiding by the Honor Code. A student who has doubts about how the Honor Code applies to any assignment is responsible for obtaining specific guidance from the course instructor before submitting the assignment for evaluation. Ignorance of the rules does not exclude any member of the University community from the requirements and expectations of the Honor Code.

For additional information about the Honor Code, please visit the following website: <https://www.honorsystem.vt.edu/>, which includes definitions of the following prohibited behaviors: cheating, plagiarism, falsification, fabrication, multiple submission, complicity, and violation of rules.

In this course, you may work with other students on your homework assignments. You are encouraged to discuss principles and methods with other students and you may compare your answers to homework problems and resolve discrepancies to maximize your ability to learn from each assignment. However, each student must perform and prepare all necessary calculations, assessments, graphs, writing, and other work that comprise each completed assignment. You are not to copy another student's homework. You may not use information from students who have taken this course previously. Every homework assignment must be accompanied by the following statement, which you must sign: "I have completed this assignment in accordance with the policies described on the course syllabus, and I have neither given nor received unauthorized assistance on this assignment."

Collaboration among students is not permitted during exams. You may not use information from students who have taken this course previously.

The OUAI recommends that I include the following information in this syllabus:

If you have questions or are unclear about what constitutes academic misconduct on an assignment, please speak with me. I take the Honor Code very seriously in this course. The normal sanction that Virginia Tech's Office of Academic Integrity will apply for a violation of the Honor Code is an F* sanction as your final course grade. The F represents failure in the course. The "*" is intended to identify a student who has failed to uphold the values of academic integrity at Virginia Tech. A student who receives a sanction of F* as their final course grade shall have it documented on their transcript with the notation "FAILURE DUE TO ACADEMIC HONOR CODE VIOLATION." You would be required to complete an education program administered by the Honor System in order to have the "*" and notation "FAILURE DUE TO ACADEMIC HONOR CODE VIOLATION" removed from your transcript. The "F" however would be permanently on your transcript.

Virginia Tech requires that, if I suspect a violation of the honor code has occurred, I must report it to the OUAI. If you suspect that a violation of the honor code has occurred, it is your responsibility to report it, and I recommend that you report it directly to OUAI, which has procedures in place to protect reporters of suspected violations.

DISABILITY ACCOMODATIONS

Students should address any special needs or accommodations with me during the first two weeks of the semester, or as soon as you become aware of your needs. Those seeking accommodations based on disabilities should obtain a Faculty Letter from the Services for Students with Disabilities office (<http://www.ssd.vt.edu/>).

PRINCIPLES OF COMMUNITY

Virginia Tech is a public land-grant university, committed to teaching and learning, research, and outreach to the Commonwealth of Virginia, the nation, and the world community. Learning from the experiences that shape Virginia Tech as an institution, we acknowledge those aspects of our legacy that reflected bias and exclusion. Therefore, we adopt and practice the following principles as fundamental to our on-going efforts to increase access and inclusion and to create a community that nurtures learning and growth for all of its members:

- We affirm the inherent dignity and value of every person and strive to maintain a climate for work and learning based on mutual respect and understanding.
- We affirm the right of each person to express thoughts and opinions freely. We encourage open expression within a climate of civility, sensitivity, and mutual respect.
- We affirm the value of human diversity because it enriches our lives and the University. We acknowledge and respect our differences while affirming our common humanity.
- We reject all forms of prejudice and discrimination, including those based on age, color, disability, gender, gender identity, gender expression, national origin, political affiliation, race, religion, sexual orientation, and veteran status. We take individual and collective responsibility for helping to eliminate bias and discrimination and for increasing our own understanding of these issues through education, training, and interaction with others.
- We pledge our collective commitment to these principles in the spirit of the Virginia Tech motto of *Ut Prosim* (That I May Serve).