# Math 476: Numerical Analysis - Winter, 2017

Course Summary. This course is part of a two-course sequence (Math 476 and 477) that together provide an introduction to many basic methods used in numerical analysis. The main topics may include: Taylor series polynomials, matrices, interpolation and approximation of functions, numerical integration and differentiation, solution of non-linear equations, acceleration and extrapolation, solution of systems of linear equations, and computer programs applying these numerical methods.
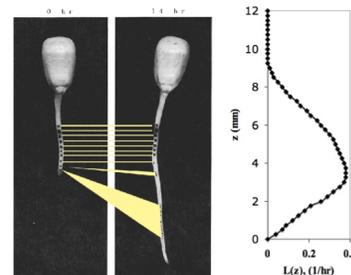
By the end of these courses you will be able to...

- Describe, present and analyze numerical methods for a specific data set, and justify their conclusions.
- Construct and analyze computational approximations for different data sets using interpolation and other polynomial approximations.
- Estimate numerical derivatives and numerical integrals for a given dataset.
- Predict and analyze the error propagation that results from mathematical algorithms.
- Evaluate other numerical approximation methods.

In addition, in this class we will reinforce:

- Applying appropriate technology to solve problems;
- Working cooperatively with others;
- Problem solving skills,
    - Describe the methods used to approach a problem;
    - Read and understand complex mathematical problems;
    - Model phenomena mathematically;
- How to express solutions in written and oral form.
    - How to "speak math", and
    - How to use logic to justify mathematical ideas,

Course Prerequisites: To succeed in this course you will need to have mastered basic calculus, proof writing, and matrix manipulation. In addition, this is a mathematics course with a substantial programming component yet the focus of the assignments is on the mathematical analysis of these programs. Any programming language can be used to complete the assignments and note that the programming component will only count for 25% of the grade of the assignment, plan to spend your time accordingly

Syllabus Changes: I reserve the right to change the policies contained in this syllabus as dictated by developments during the quarter.

Instructor Contact Information

Instructor:	Brandy Wiegers, PhD
Email:	brandy.wiegers@cwu.edu
Office:	Bouillon 107A
Phone:	(509) 963-2163
Website:	http://www.cwu.edu/math/dr-brandy-wiegers

The best way to contact the instructor is at office hours or via email. Expect a 12-24 hour delay in response. If you haven't received a response within 24 hours of the original email please contact the professor again.

Course Components

Class Meeting Time:
Monday	11:00-11:50 AM	Hertz Hall 104
Tuesday	11:00-11:50 AM	Hertz Hall 104
Wednesday	11:00-11:50 AM	**Bouillon Hall 103 PC Lab**
Thursday	11:00-11:50 AM	Hertz Hall 104

Question/Answer Office Hours:
MTWTh   2:00-3:00pm   Bouillon 107A
Office Hours may be changed to meet the needs of the class. Additional office hours are available via appointment, please email the instructor to schedule these meetings.

Text: Numerical Analysis for Engineers. Bilal Ayyub & Richard H. McCuen. Published by Chapman and Hall/CRC. 2015. ISBN 9781482250350
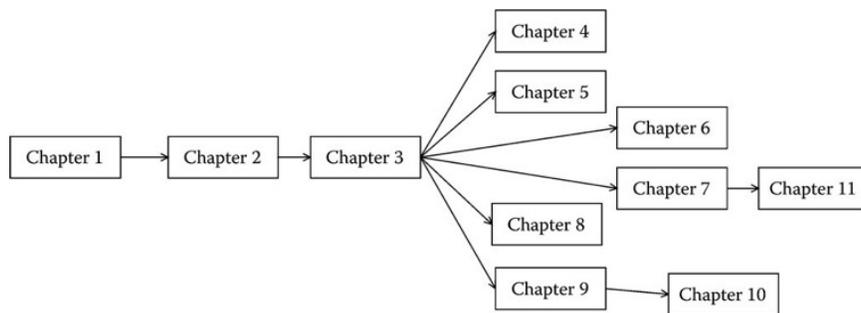
Course Website: http://www.cwu.edu/math/applied-analysis-math-476-477
All course information including assignments and course project information will be available on Canvas. The website will provide supplementary resources to support your coursework.

Computer Access: Regular computing assignments will play a role in this course. If you do not have personal computer access make sure to start assignments early and make use of the CWU computing resources.

Grading

The following table reflects the planned letter grade for the course structure:

Total	100-93	92-90	89-87	86-83	82-80	79-77	76-73	72-70	69-67	66-63	62-60	59-0
Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F

Final grades will be computed based on five types of assessment:
In-class work and homework	15%
Weekly Quizzes	15%
Midterm Exam	15%
Final Exam	15%
Computer Assignments	40%

See following pages for further details about each assessment type.

In-class work and homework

Attendance will be taken daily and homework will be assigned regularly to be turned in at the beginning of class, often via Canvas or on paper in class. If you are not present, you will miss the points for this work but you should still check on Canvas for the missed worksheet or assignement. There are no make-ups for in-class assignments. Keep in mind that not doing handouts during class (sleeping, Facebook, texting) or leaving as soon as they are given will result in point loss. No late homework will be accepted without a university accepted excuse note.

Keeping up with the homework is one of the best things you can do to help yourself succeed in this course! Don't expect an email response to homework inquiries within 12 hours of the due date time. Start early and come to office hours.

Also, be aware that you will receive more partial-credit on exams for showing work. Practice communicating your understanding of the problem by writing problems out by hand.

Note: All written assignments must be typed or written in clear handwriting. If your instructors cannot read your work, they cannot grade it. You will get a zero on the assignment if it is illegible, is not stapled together, has frizzy edges, or does not have Name, Assignment #, and Date on the item.

Weekly Quizzes

Quizzes will be given on Monday at the start of class. The quizzes will be based on recent sections that we covered in class lectures and worksheets or on homework. The focus of the quizzes will be on computation and vocabulary, but also on algebraic processes. This will be important practice for the exams.

Exams

Midterm Exam: Wednesday, February 8, 2017. During class, 1 hour.
Final Exam: Wednesday, March 15, 2017, 8:00-10:00 AM, 2 hour.
You must be present at the final exam! Add it to your calendar now.

A missed exam will be given a zero and there will be no make-up exams. The only exceptions to this will be made completely at the discretion of the instructor and will only be granted for serious and compelling reasons. Please contact me ASAP to ensure the likelihood have having your issue taken seriously.

Computational Projects

There will be 5 computational Projects, and all 5 will be counted toward your grade.
Students will be assigned to five computer projects throughout the course that will highlight the particular mathematical methods. You are welcome to write your code in any computer language that you feel comfortable with however, it must be a general purpose programming language that does not give any special assistance in implementing the algorithms we're studying. More information will be available on the website and in class.

DRAFT- Assignment Descriptions and Deadlines, subject to change

Assignment	Description	Due Dates
Project 1	Taylor Polynomials	January 17
Project 2	Error Propagation	January 31
Project 3	Interpolating Polynomials	February 14
Project 4	Cubic Splines	February 28
Project 5	Derivation Approximation	March 15

Assignment Due Dates: Incomplete projects will NOT be accepted for credit. In order to receive full credit for an assignment, it MUST be completed and turned in by class time on the specified due date. Any assignment turned in late, but on or before the following class period will receive a maximum of one-half credit. Any assignment turned in after this date will not be graded and no credit will be given for it.

Assignment Format: To meet the learning objective of technical report writing, for each of the programming assignments you will write a brief technical report which answers the given questions and illustrates the fundamental ideas in clear, concise, descriptive English prose. The report should separate the required tasks of the given project and document each in the appropriate section, i.e. Analysis, Computer Program, or Results. **Refer to the Project Format Directions for more details on each section**.

Project Grading
Analysis, 25%
Computer Program, 25%
Results and Discussion, 25%
Style, 10%
Post Assignment Review and Reflection, 15%
As you can see, the focus of the assignments is on the mathematical analysis of these programs, not the program. Please plan your time accordingly.

Collaboration

You are encouraged to talk to classmates about your computer assignments and other problems from classwork but you must complete all assignments by yourself. This means that you can discuss your algorithms as a group but you need to create individual codes and individual results. If you do talk with others please indicate who your group members were on your assignment.
Please be reminded that the Washington State Legislature defines Academic Dishonesty, `http://app.leg.wa.gov/WAC/default.aspx?cite=106-120-027`

University Policies

Religious Holidays: Reasonable accommodations will be made for you to observe religious, holidays when such observances require you to be absent from class activities. It is your responsibility to inform the instructor during the first two weeks of class, in writing, about such holidays.

Academic Integrity: While completing this course you must follow the CWU Student Code of Conduct which is defined by Washington State. Please be reminded that the Washington State Legislature defines Academic Dishonesty in all its forms including, but not limited to the following:

- Cheating on tests.
- Copying from another students test paper.
- Using materials during a test not authorized by the person giving the test.
- Collaboration with any other person during a test without authority.
- Knowingly obtaining, using, buying, selling, transporting, or soliciting in whole or in part the contents of an unadministered test or information about an unadministered test.
- Bribing any other person to obtain an unadministered test or information about an unadministered test.
- Substitution for another student or permitting any other person to substitute for oneself to take a test.
- "Plagiarism which shall mean the appropriation of any other persons work and the unacknowledged incorporation of that work in ones own work offered for credit.
- "Collusion which shall mean the unauthorized collaboration with any other person in preparing work offered for credit.

For more details visit: `http://app.leg.wa.gov/WAC/default.aspx?cite=106-120-027`

Support Services/ Accommodations: Central Washington University is committed to creating a learning environment that meets the needs of its diverse student body. If you anticipate or experience any barriers to learning, discuss your concerns with me. Students with disabilities should contact Disability Services to discuss a range of options to removing barriers, including accommodations. Student Disability Services is located in Hogue 126. Call (509) 963-2214 or email `ds@cwu.edu` for more information. Also, please let me know if you need me to accommodate for a disability in anyway, I am glad to do so!

Incompletes: The College Policy on Incompletes states that Incompletes are used when the student was not able to complete the course by the end of the term, but has satisfactorily completed a sufficient portion of it and can be expected to finish without having to re-enroll in it. In this course, students who have not completed substantial coursework should not assume that they will be given an incomplete at the end of the semester. If you have concerns about this you should talk to the course instructor and your academic advisor.

Summary of Important Dates: Refer to `https://www.cwu.edu/calendar` to verify

Jan 10	Change of Schedule Period Ends (Add/Drop classes)
	(Drops completed prior to this date or by the close of business on this date will not appear on transcripts or have tuition assessed).
Jan 10	Deadline to declare audit & credit/no credit grading.
Jan 16	Martin Luther King Jr. Holiday, No class will be held.
Feb 2	Deadline for 50% refund with complete withdrawal
Feb 20	President's Day Holiday, No class will be held.
Feb 17	Uncontested withdrawal period deadline
Mar 10	Withdrawal from classes or university.
	Not permitted except for "serious and compelling reasons."