# MATH 477: NUMERICAL ANALYSIS - Spring, 2018

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.
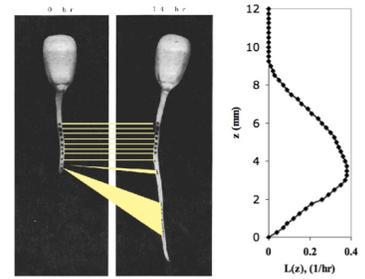
By the end of Math 476 and 477 courses you should be able to...
- Describe, present and analyze numerical methods for a specific data set, and justify their conclusions.
- Construct and analyze computational approximations for different data sets using interpolation and other polynomial approximations.
- 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.

My goal is to create a human experience in mathematical exploration and problem solving while achieving these learning objectives. To support this I will ...
- Regularly communicate the expectations for coursework
- Provide assignments to support your coursework and understanding.
- Make any assignments for the following day by the end of the class period. (ie: all assignments will be posted on Canvas $\geq$ 23 hours prior to the due date).
- Provide regular opportunities for you to assess what you have learned and provide feedback on what you still need to work on.

In this course I expect that you will ...
- **Participate actively in group-work and class discussions**: Each class will be designed to engage you in gaining a deeper understanding of the material. You will often work in small groups to provide opportunities for each student to talk about the mathematics in the lesson. A part of building understanding is being able to describe what you are thinking and explain your reasoning. You will also need to listen to, compliment, and also critique the reasoning of other students, in a respectful manner.
- **Ask questions**: In class time is your opportunity to ask lots of questions! I will help you learn how to ask questions, how to answer your own questions, how to use resources like your textbook, classmates, etc. Also, don't forget that professors are human too. Sometimes we make mistakes. If you think I've made an error reach out and ask me, I would be happy to discuss it with you.
- **Come to class prepared to engage in mathematical thinking**: You will be asked to turn in something each day. Mathematics is a creative endeavor that slowly builds over the course. To do that you need to do a little bit of work each day. Daily assignments help you practice the work outside of class. These assignments will be about the process, the logic and the justification, not the answer! These will be turned in and graded for completion. Learning mathematics takes a lot of practice and work. You will be expected to spend around 2-3 hours working on and studying for this class each night. In total, you will be expected to spend 8-10 hours a week studying for this class. Additionally, you will need to put in extra time studying for exams.
- **Check your email and the Canvas website regularly!**

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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 by assigning weights to the following categories, described in more detail in the following pages:

Assessment Category	Percentage of final grade
In-class participation and homework	15%
Weekly Quizzes	15%
Midterm Exams	20%
Final Project and Presentation	10%
Computer Projects	40%

In-class participation 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 assignment. Late (up to one class period) and incomplete homework assignments will be worth partial credit (so you will receive either 10, 5, or 0 points for these assignments and attendance).

Much of the homework will be repurposed for the computing projects. Use the homework to practice communicating your understanding of the problem by writing problems out by hand to gain practice with the process and then coding them via a computing program of your choice to gain the computing practice.

Keeping up with the homework is one of the best things you can do to help yourself succeed in this course! Also, the professor only responds to email 2 to 3 times a day so don't expect an email response to homework inquiries within 12 hours of the due date time. Start early and come to office hours.

Weekly Quizzes

Quizzes will be given on Tuesday and due within two class periods. When completing the quiz please do not use your notes, your colleagues, or other references, make sure the work is an assessment of your current knowledge of the topic. 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, and on processes. This will be important feedback for your current understanding of course material.

Midterm Exams

Tentative dates for midterm exams:
- Thursday, March 29, 2018. Take-home, due Monday, April 2 at 5pm.
- Thursday, May 4, 2018. Take-home, due Monday, May 7 at 5pm.

A missed exam will be given a zero and there will be no make-up exams unless the student can provide evidence for serious and compelling reasons to miss the exam. Please contact me as soon as possible to start a dialogue if you are worried about missing an exam.

Final Project and Presentation

We are scheduled for a final presentation on Wednesday, June 6, 2018, 8:00-10:00 AM.
You must be present at the final! Add it to your calendar now.

Computational Projects

There will be four computational projects this quarter and all will be counted toward your final grade. Students will be assigned 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. This means you are expected to program the algorithms/methods by hand (rather than using a built-in program). For example, you will code Taylor's polynomials from definition rather than using Taylor[] in Mathematica.

DRAFT- Assignment Descriptions and Deadlines, subject to change

Assignment	Description	Due Dates
Project 7	Numerical Integration	April 13
Project 8	Cubic Splines	April 27
Project 9	Least Squares Approximation	May 11
Project 10	Dealer's Choice	May 25

More information will be available on the website and in class.

Late Computational Projects

In order to receive full credit for an project, it MUST be completed and turned in before the due date. Any assignment turned in late, but on or before the following class period will have the score reduced by 10% per course day that is late, up to 50%. So if it's due on Friday and turned in on Monday the student will be eligible for 90% full credit, continuing to reduce to 50% credit by the following Monday. Any assignment turned in after this 1-week late date will not be graded and no credit will be given for it. I do this to encourage you to do the assignments on time as previous students who got behind in this course have struggled to ever catch-up.

Submit work that meets the 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 specific Project Format Directions for more details on each section**.

Computational 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

April 3	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).
April 3	Deadline to declare audit & credit/no credit grading.
April 26	Deadline for 50% refund with complete withdrawal
May 11	Uncontested withdrawal period deadline
May 28	Memorial Day Holiday, No class will be held.
June 1	Withdrawal from classes or university.
	Not permitted except for "serious and compelling reasons."

Course Components

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.

Class Meeting Time:

Monday & Thursday	10:00-10:50 AM	**Bouillon Hall 103 PC Lab**
Tuesday & Wednesday	10:00-10:50 AM	**Bouillon Hall 106**

Question/Answer Office Hours:

Mon, Tues, Weds	11:30 am - 12:30 pm	Bouillon 108D
Thurs	2:30 - 3:30 pm	Bouillon 108D

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.

Text

Introduction to Numerical Methods and Analysis. 2nd Edition. Author: James Epperson.
Published by Wiley. ISBN: 978-1118367599

Course Website: `http://canvas.cwu.edu`

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.

Instructor Contact Information

Instructor:	Brandy Wiegers, PhD
Email:	`brandy.wiegers@cwu.edu`
Office:	Bouillon 108D
Phone:	(509) 963-2125
Website:	`http://www.cwu.edu/math/dr-brandy-wiegers`

The best way to contact the instructor is at office hours or via email. *That said, professors often only respond to email 2-3 times a day so 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.*

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