Math 351: Introduction to Numerical Analysis

Winter 2020

(Section 1, CRN 36540)

Course Credits: 3
Lectures: 9:00 - 9:50 AM on MWF at Bexell Hall 321.
Instructor: Tuan Pham, [phamt3@oregonstate.edu]
Couse website:
http://people.oregonstate.edu/~phamt3/Courses/W20-Math-351/W20-Math-351.html
Office: Kidder 268, **phone:** 541-713-6196
Office Hours:

> Mon, Wed, Fri 1:00 - 2:00 PM at Kidder 268,
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> Thu 12:00 - 2:00 PM at Kidder 268,
>
> Wed 2:00 - 3:00 PM at Kidder 108 J (computer lab).

Textbook: "*Elementary Numerical Analysis*" 3rd edition, by Atkinson and Han. Unfortunately, it is not free, but the Matlab codes mentioned in the book can be downloaded here: http://homepage.divms.uiowa.edu/~atkinson/ena_master.html. Our lectures will not strictly follow the order in the textbook (see the tentative calendar). Other helpful materials (not required) are:

- "*Applied Numerical Method using Matlab*" by Yang, Cao, Chung, Morris. It is accessible through ONID account https://onlinelibrary-wiley-com.ezproxy.proxy.library.oregonstate.edu/doi/pdf/10.1002/0471705195.
- "*Numerical Analysis*" by Burden and Faires.

Course Description: in this course, you will be introduced to (1) numerical methods to solve approximately mathematical problems that cannot be solved by hand, and (2) the analysis of errors. The topics include rootfinding for nonlinear equations in one variable, interpolation of functions, numerical integration, numerical differentiation. If time allows, we will discuss some application to solve some differential equations arising from physics and biology.

Math 351 Learning Outcomes: A successful student in MTH 351 will be able to:

1. Perform basic methods to solve nonlinear equations: bisection method, Newton's method, fixed point method.

2. Understand the analysis of error coming from polynomial approximation, numerical integration, etc.

3. Understand the source of error and interpret error from graphs/outputs.

4. Choose an effective numerical method (or understand the limitation of a numerical method) for a given problem.

5. Develop some experience in using mathematical software (Matlab) to implement algorithms.

Topics covered: See the tentative calendar.

Grading:
Homework: 35%
In-class activity: 10%
Midterm: 25%
Final Exam: 30%

Homework: there will be 8 homework sets, each due on Friday at the beginning of class, except for the first week and the week of midterm exam. There will be some problems which you can handwrite and some problems which require you to code on Matlab. Each homework set is worth 30 points. You may earn up to 3 bonus points in each homework set (adding up to a maximum of 33 points per homework set) based on the clarity of your write-up and the amount of arguments and comments provided on problems and/or Matlab codes. The lowest homework score will be dropped.
Policy: Homework must be turned in on paper. You do not need to print out the Matlab codes if they are lengthy. These are to be submitted on Canvas as .m files. *Please do not upload scanned copies of your homework.* They will not be accepted unless you have approval from the instructor. You are encouraged to work together in groups. However, homework must be written individually in your own words and reflect your own understanding. Late homework will not be accepted. Turn in whatever you have completed by the due time. Only a few selected problems will be graded in detail. The rest will be given credit based on completion.
Requirements for written work: To obtain full credit for your work, you should write coherently, in complete sentences, with attention to the reader.
Mathematical software: we will use Matlab to implement algorithms. You can download Matlab with OSU's license to your personal computer here: https://is.oregonstate.edu/service/software/matlab. If you are unable to install it on your computer, you can use the online version through Citrix Receiver (see the course website for instruction). Or you can use computers at the lab room Kidder Hall 108 J almost anytime from 9 AM to 4 PM, Monday through Friday.

In-class activity: there will be worksheets handed out in class at random times on random days. You will take a picture of the whole front page (make sure the your name is readable) and upload it on Canvas. The due time is 1 PM of the same day the worksheet is given. Worksheets are given in class only. The lowest 2 worksheet scores will be dropped. Each worksheet will be graded on the scale of 2. Zero point is given if worksheet is not submitted online or no meaningful work is shown. One point is given if worksheet shows too little work. Two points if there is a reasonable amount of work shown. You can discuss with your partner(s) or ask the instructor for help.

Midterm Exam: in class, on Monday Feb 10.
Policy: Calculator is allowed, but note cards are not. Proctor can provide extra draft papers

upon request. Some formula will be given on the front page of the exam. Any regrading request must be addressed within two weeks after the exam is returned. There will be no make-up exam except for exceptional reasons.

Final exam: 2:00 - 3:50 PM, Thursday Mar 19. Room TBA.
Policy: the Final exam is not cumulative. It focuses mostly on the second half of the term. Policy is the same as midterm exam. Any requests for special accommodation (make-up exam, etc) must be addressed to instructor prior to the day of the Final exam. Skipping Final exam will automatically result in a grade of F.

Grade lines: the course grades will not be harder than: A 100-90%, B 89-80%, C 79-70%, D 69-60%, and F 59% and under. Scores on Canvas are raw scores. The running total that Canvas provides may not be accurate since it does not take into account the percentage of homework/exams as indicated above. Instructor will calculate total course scores at the end of the term.

Other Learning Resources: The Math Learning Center MLC in Kidder 108 is a great place to drop in for help. It is open from 9 AM to 4 AM Monday through Friday from the second week of classes to the end of dead week.

Academic Honesty
Students are expected to comply with OSU's Student Conduct Code:
http://studentlife.oregonstate.edu/code
Accordingly, academic dishonesty is defined as an intentional act of deception in one of the following areas:
Cheating – use or attempted use of unauthorized materials, information, or study aids.
Fabrication – falsification or invention of any information.
Assissting – helping another commit an act of academic dishonesty.
Tampering – altering or interfering with evaluation instruments and documents.
Plagiarism – representing the words or ideas of another person as one's own.

Statement Regarding Students with Disabilities
Accommodations for students with disabilities are determined and approved by Disability Access Services (DAS). If you, as a student, believe you are eligible for accommodations but have not obtained approval please contact DAS immediately at 541-737-4098 or at http://ds.oregonstate.edu. DAS notifies students and faculty members of approved academic accommodations and coordinates implementation of those accommodations. While not required, students and faculty members are encouraged to discuss details of the implementation of individual accommodations.

Reach Out for Success
University students encounter setbacks from time to time. If you encounter difficulties and need assistance, it is important to reach out. Consider discussing the situation with an instructor or academic advisor. Learn about resources that assist with wellness and academic success at http://oregonstate.edu/ReachOut. If you are in immediate crisis, please contact the Crisis Text Line by texting OREGON to 741-741 or call the National Suicide Prevention Lifeline at 1-800-273-TALK (8255)