

## Welcome to Math 567 Applied Numerical Methods II – Winter 2015

15:00 - 15:50 M-F in Bouillon 101, Fridays in Bouillon 103

**Instructor:** Dr. Jean Marie Linhart

**Phone:** (509) 963-2123

**Webpages:** (course) <http://canvas.cwu.edu>  
(me) <http://www.cwu.edu/math/jean-marie-linhart>

**Office:** Bouillon 119

**E-mail:** [jmlinhart@cwu.edu](mailto:jmlinhart@cwu.edu)

**Office Hours:** M-Th 11:00 - 11:45 am  
and by appointment.

**Course Goals:** Math 567 is a second course in numerical methods and analysis for Computational Science Master's Degree students. Our focus will be on how computers make mathematical errors, and what we can do about this. The main topics I expect to cover this quarter are

1. Estimating derivatives.
2. Numerical integration and quadrature rules, including the trapezoid method, Simpson's Rule, and Gaussian Quadrature.
3. Initial value problems in differential equations and their theoretical solutions, Euler's method, implicit Euler, Runge-Kutta method order 2 and 4. Changing higher order equations into first-order systems.
4. Boundary value problems via the shooting and discretization method
5. Linear Systems: Matrix Factorization, Eigenvalues and Eigenvectors, Singular Values, Iterative Solutions.
6. Least squares Methods
7. Monte Carlo Methods, generating random numbers, finding areas and volumes, simulation

Additionally, it is my hope that this course is a step in your preparation for a successful career. The behavior and standards expected of a professional in the work place are what you should aim for in all aspects of work, attendance, and preparation for this course.

We will be using the computer lab in Bouillon 103 weekly.

**Required Text:** *Numerical Mathematics and Computing*, by Ward Cheney and David Kincaid, 7<sup>th</sup> ed.; Brooks-Cole/Cengage.

## Grades/Exams/Homework

### Grades

Grades will be calculated using the following weighting system:

Assignments: 65%;

Reading Notes and questions: 10%

Attendance and Participation: 5%;

Final Exam or Final Project: 20%

and the following scale:

	87 – 89.9 : B+	77 – 79.9 : C+	67 – 69.9 : D+	below 60 : F
93 – 100 : A	83 – 86.9 : B	73 – 76.9 : C	63 – 66.9 : D	
90 – 92.9 : A–	80 – 82.9 : B–	70 – 72.9 : C–	60 – 62.9 : D–	

### Assignments

Assignments will take the form of approximately weekly or biweekly homework, written, programming, and short writing assignments. They are essential for your understanding of the material in the course. It is likely an assignment will be due during the last week of the course and/or during finals week.

For take-home assignments, please attempt the problems on your own, without using outside resources. If you are stuck, you are welcome to work with other students, use the web or books to gain additional insight. However, you must put these other resources away, and write up your own understanding of the solutions in your own words, and you must do your own programming. More information on my policy on working with others and using outside resources is available at

<http://www.cwu.edu/math/group-work-and-using-outside-resources>. Copying will result at minimum with a zero on the assignment, and will be reported to student conduct.

## Exams

There will be a final exam. At the discretion of the instructor, a final project or a take-home final may be assigned in lieu of an in-class final. The final is worth 20% of the final grade. The date (or due date for) the final exam will be on **Tuesday, March 17 at 12 pm**. The Final Exam will be cumulative, and **cannot** be taken early. If you miss an exam, you may be allowed to take a make-up. To get a make-up, you must notify me before the exam (if possible) or within 24 hours after the exam. In addition, a make-up is only allowed if you have proof of a compelling reason for having missed the exam. When a make-up exam cannot be taken before I return the corrected exam, I may instead replace that portion of your course grade with your final exam grade. You will be allowed to bring in a sheet of 8.5 × 11 inch paper filled out front and back for use with the final exam. You must fill out your own note sheet.

## Attendance/Participation

If you are not in class when attendance is taken, you will likely be marked absent for the day. Participation will be evaluated on the basis of attendance, participation while in class, and participation in any discussion that takes place online for the course. When in class or the computer lab, you are given time to work, you are expected to work on material for this course unless you have explicit permission from me to do something else. Working on something other than our course work during work time will result in reduced credit for attendance and participation.

## Late and Make-up Policy for Assignments and Projects

I expect you to hold yourself to professional standards in this class. Because even professionals sometimes run into conflicts, I will accept at most **two** late assignments or projects for full credit, provided you ask permission to hand them in late at least half a day before the due date, thus showing me that you are planning ahead. To get credit for a late assignment or project, it must be turned either before I return the corrected assignments to the rest of class or within two days of instruction of the due date or by a date mutually agreed upon by student and instructor, whichever comes first. After two late assignments have been accepted, I will not accept any late work for credit.

Reading assignments must be completed on time to be of value to you in discussing the section. I will drop the lowest two scores.

## Academic Integrity

You are expected to do your own work. While you are welcome to use outside resources and consult with others on all work taken home, you are subject to the requirement that what they hand in should, in fact, represent your own understanding of the material and not work copied or memorized from another source.

All in-class exams are expected to be done without any resources except those explicitly authorized by the instructor. Exams and quizzes are not to be discussed with others who may not yet have taken the exam or quiz or within earshot of anyone who may be taking the exam or quiz at a later time.

If a paper or report is assigned, students are expected to conform to academic standards for citing summarized, paraphrased and quoted work used; if you are not sure what this means, please **ask**.

Cheating will result in at minimum a zero on the assignment, quiz or exam. Cheating will be reported to the office of student conduct. Egregious offenses may result in a failing grade for the course and/or more serious consequences as merited by the situation.

## Expectations

As I am preparing you for employment out there in the *real world*, I expect you to adhere to professional standards while taking my class. Daily attendance is expected. Be on time and prepared, take notes. Work should be neat and well-organized, and certainly should be handed in on-time.

Math classes are considered difficult largely because the material is hierarchical in nature; you must master the first step to be able to manage the next.

### Secrets for success:

1. You should budget a minimum of 10-15 hours per week for work outside of class.
2. Start on the assigned work as soon as you can.
3. Attempt to work on your math every day or at least every other day. The hardest part is usually getting started. Find a quiet place to work, get your book and notes together. Put away distractions such as your cell phone, TV, or laptop. Then, set a timer for 30-45 minutes (or 15 if you are having a bad day) and resolve to put your best effort in for at least that length of time.
4. Discussing problems and solutions with peers and using the internet is encouraged, with two caveats.
  - Before you go ask or look for a solution, make an honorable effort to solve the problem on your own. Spend time thinking and strategizing before asking or searching for help.
  - You must write up your understanding of a solution **on your own**. You may not copy anyone else's work. See my [guide to group work and using outside resources](http://www.cwu.edu/math/group-work-and-using-outside-resources), <http://www.cwu.edu/math/group-work-and-using-outside-resources>, on the web.
5. As you progress in your university studies and in your career, problems get more and more difficult to solve. You may have to start with easier (unassigned) problems before you are even ready to start to work on an assigned problem. Some problems may take more than an hour to solve. Persistence pays off.
6. You must show your work with mathematical symbols and formulas, but in addition to this, you must also explain what you are doing. Use your words. This will help you to understand the concepts critical to success in the class, and will help you get a higher grade.
7. I am always happy to help you if you are stuck. You will get the most out of my help and the University Math Center if you attempt the problem on your own or with your peers before asking an expert.
8. Do your scratch work before you do a final write-up of your work. What you hand in should be neat and professional and all pages should be stapled together.

### Important Dates

January 12 – Last Day for Add/Drop

January 19 – Martin Luther King Jr. Holiday, no classes

January 28 – Faculty Development Day, no classes

February 16 – President's Day Holiday, no classes

February 20 – Last day for uncontested withdrawal

March 13 – last day of classes

March 17 - final exam (12 pm)

### Students with Disabilities

I am happy to work with students with disabilities. To set up academic adjustments in this class, you should give me a copy of your *Confirmation of Eligibility for Academic Adjustments* from the Disability Support Services Office and come see me in office hours or make an appointment to come see me as soon as possible so we can discuss how the approved adjustments will be implemented in this class. Students without this form should contact the Disability Support Services Office, Bouillon 140 or [dssrecept@cwu.edu](mailto:dssrecept@cwu.edu) or (509) 963-2171.

## Tentative Schedule

T Jan 6, 2014	syllabus, final, section 4.3	T Feb 10, 2014	section 8.1
W Jan 7, 2014	section 4.3	W Feb 11, 2014	section 8.2
Th Jan 8, 2014	section 5.1	Th Feb 12, 2014	section 8.2
F Jan 9, 2014	section 5.1	F Feb 13, 2014	Lab
M Jan 12, 2014	section 5.3	M Feb 16, 2014	President's Day; no class
T Jan 13, 2014	section 5.3	T Feb 17, 2014	section 8.3
W Jan 14, 2014	section 5.4	W Feb 18, 2014	section 8.3
Th Jan 15, 2014	section 5.4	Th Feb 19, 2014	section 8.4
F Jan 16, 2014	Lab	F Feb 20, 2014	Lab
M Jan 19, 2014	MLK Day; no class	M Feb 23, 2014	section 8.4
T Jan 20, 2014	ODE Intro	T Feb 24, 2014	section 8.4
W Jan 21, 2014	ODE Intro	W Feb 25, 2014	Markov Chains/Google Search
Th Jan 22, 2014	section 7.1	Th Feb 26, 2014	SVD
F Jan 23, 2014	Lab	F Feb 27, 2014	Lab
M Jan 26, 2014	section 7.2	M Mar 2, 2014	section 9.1
T Jan 27, 2014	section 7.3	T Mar 3, 2014	section 9.1
W Jan 28, 2014	Fac. Dev, Day; no class	W Mar 4, 2014	section 9.2
Th Jan 29, 2014	section 7.4	Th Mar 5, 2014	section 9.2
F Jan 30, 2014	Lab	F Mar 6	Lab
M Feb 2, 2014	section 7.4	M Mar 9, 2014	section 9.4
T Feb 3, 2014	section 11.1	T Mar 10, 2014	section 9.4
W Feb 4, 2014	section 11.1-11.2	W Mar 11, 2014	section 10.1
Th Feb 5, 2014	section 11.2	Th Mar 12, 2014	section 10.1
F Feb 6, 2014	Lab	F Mar 13, 2014	Lab
M Feb 9, 2014	section 8.1	T Mar 17, 2014	Final Exam