

MATH 458, Fall 2019  
(39679R, Lecture, 39680R 39681R-Discussion)

## **Numerical Methods**

### **Instructors**

Lecture: Dr. Chunming Wang	Teaching TA: TBA
Office: KAP 244C	Office:
Phone: (213) 740-6097	Phone:
e-Mail: <a href="mailto:cwang@usc.edu">cwang@usc.edu</a>	e-Mail:
Office Hours: MW 4:30PM-6PM	Office Hours:

### **Course Description**

MATH458 is an introductory course for numerical analysis and scientific computing. On the theoretical side, this course provides an overview of numerical techniques for solving many important mathematical problems including solution of system of linear equations, solution of nonlinear equations, polynomial and spline interpolation, numerical integration, numerical methods for ordinary partial differential equations and numerical optimization problems. On the computational side, we use software such as Matlab to introduce the basic steps of implementing and validating algorithms for solving numerical mathematics problems. For most of graduate students in science and engineering disciplines, this class also offers a comprehensive review of mathematics for solving engineering and scientific problems.

### **Textbook and Reference**

Uri M. Ascher, Chen Grief, A First Course in Numerical Methods, SIAM Computational Science & Engineering, 2011

Timothy Sauer, Numerical Analysis, Pearson, Addison Wesley, 2006.  
Germund Dahlquist and Ake Bjorck, Numerical Methods in Scientific Computing, SIAM, 2008

### **Grading Policy**

Homework: 15%, Project: 10%, Quiz: 20%, Midterm Exam: 25%, Final Exam: 30%.  
Final Exam: Wednesday, December 11, 11 a.m.-1 p.m.

<i>Monday, August 26</i> Introduction to Algorithm	<i>Wednesday, August 28</i> Introduction to Algorithm	<i>Friday, August 30</i> Round-off Error
<i>Monday, September 2</i> Labor Day	<i>Wednesday, September 4</i> Linear Systems, Direct Methods	<i>Friday, September 6</i> Linear Systems, Direct Methods
<i>Monday, September 9</i> Linear Systems, Direct Methods	<i>Wednesday, September 11</i> Least Square Problems	<i>Friday, September 13</i> Least Square Problems
<i>Monday, September 16</i> Least Square Problems	<i>Wednesday, September 18</i> Least Square Problems	<i>Friday, September 20</i> Eigenvalues
<i>Monday, September 23</i> Eigenvalues	<i>Wednesday, September 25</i> Iterative Methods	<i>Friday, September 27</i> Iterative Methods
<i>Monday, September 30</i> Iterative Methods	<i>Wednesday, October 2</i> Computation of Eigenvalues	<i>Friday, September 4</i> Computation of Eigenvalues
<i>Monday, October 7</i> Computation of Eigenvalues	<i>Wednesday, October 9</i> Nonlinear Systems	<i>Friday, October 11</i> Nonlinear Systems
<i>Monday, October 14</i> Nonlinear Systems	<i>Wednesday, October 16</i> Midterm Exam	<i>Friday, October 18</i> Fall Recess
<i>Monday, October 21</i> Nonlinear Systems	<i>Wednesday, October 23</i> Nonlinear Systems	<i>Friday, October 25</i> Nonlinear Systems
<i>Monday, October 28</i> Numerical Differentiation	<i>Wednesday, October 30</i> Numerical Differentiation	<i>Friday, November 1</i> Polynomial Interpolations
<i>Monday, November 4</i> Polynomial Interpolations	<i>Wednesday, November 6</i> Polynomial Interpolations	<i>Friday, November 8</i> Polynomial Splines
<i>Monday, November 11</i> Polynomial Splines	<i>Wednesday, November 13</i> Polynomial Splines	<i>Friday, November 15</i> Best Approximation
<i>Monday, November 18</i> Best Approximation	<i>Wednesday, November 20</i> Numerical Integration	<i>Friday, November 22</i> Numerical Integration
<i>Monday, November 25</i> Numerical Integration	<i>Wednesday, November 27</i> Thanksgiving	<i>Friday, November 30</i> Thanksgiving
<i>Monday, December 2</i> Differential Equations	<i>Wednesday, December 4</i> Differential Equations	<i>Friday, December 6</i> Differential Equations

**This is a tentative schedule. The contents of lectures may change significantly.**