Math 6650
Numerical Analysis: Approximation Methods
Spring 2021-2022
Call Number 10318 -100

Class homepage:	**On [Blackbord](#)**
Time:	MWF 4:10 to 5:05 pm, 318 Morton Hall
Instructor:	[Dr. Annie X. Shen](#), https://www.ohio.edu/cas/shenx
Office:	571 Morton Hall
Office Hours:	Wed and Friday 02:00-3:00 pm or by appointments.
Email:	shenx@ohio.edu
Phone:	740-593-1288

(Please visit Blackboard frequently for class activities)

- **Catalog Description**. In-depth treatment of numerical approximation techniques, including differentiation and integration.

- **Prerequisite**. MATH 4600/5600 or equivalent. Because it is computational in nature, knowledge and working experiences of at least one of programming languages such as MatLab, Python, R, C/C++, or FORTRAN, are highly recommended. Please see the instructor if you do NOT meet any of these prerequisites. Class instruction is based on Matlab and R.

- **Coverage**. Selected topics from:
  Part I. **Basics Approximation Theory and Algorithms**
  1. Interpolation and approximation
  2. Numerical differentiation and integration
  Part II. Applications
  1. Signal approximation
  2. Fourier and wavelets transforms, Shannon sampling theorem
  3. Kernel based method in machine learning
  4. Bivariate signal approximation - Computerized tomography
- **Textbooks**.
  Book1. [Walter Gautschi, Numerical-Analysis, Birkhauser Boston; 2nd edition, 2011. ISBN-10: 0817682589.](#)
  Book2. [Approximation theory and Algorithms for Data Analysis, *Texts in applied mathematics*, volume 68, Springer, 2018. ISBN: 9783030052287](#).
  Electronic copy can be downloaded from Alden Library

- **Homework/Assignments**

Homework list will be available at Blackboard. Assignments are graded on accuracy, completeness, and good programming methods. Document your programs with comments. Your work should be clear enough that any reader could reproduce your results. Do not submit everything that appears in the console. Instead, copy the essential output and paste it into a report. It is convenient to use the function dairy and script editor in Matlab to prepare the report or use and windows word processor.

For each assignment submit
 (1) Electronic copy of your program (s);
 (2) Report containing neatly organized and annotated output; including specific answers to any questions;
 (3) Attach any graphs required, labeled as Figure 1, Figure 2, etc. and reference by figure number in part (2) Each figure must have a caption/title.

- **Grading Policy**

All exams should be done independently; otherwise you will be guilty of plagiarism. A student who is caught cheating will get an F for the course and will be referred to student judiciaries for further action.

Score   [0, 60)   [60, 70)   [70, 80)   [80, 90)   [90,100]
Letter grade   F   D   C   B/B+   A-/A

Extra credit problems will not be assigned. Letter grades will be assigned at the end of the academic term and are based on

Homework	25	5 sets, 5 points each.
Reading	10	2, 5 points each
Midterm exams	35	8th week, Wed, March 02, 2022
Final Project	30	Written report and in class presentation (Final reports due Monday, April 25, at 4:40 p.m.)

- **Copyrights of class materials**. The lectures, classroom activities, and all materials associated with this class and developed by the instructor are copyrighted in the name of the instructor on the date 08/26/2013.

- **Accommodation for disability**. Any student who suspects s/he may need an accommodation based on the impact of a disability should contact the class instructor privately to discuss the student's specific needs within the first week of class and must provide written documentation from the Office of Student Accessibility Services. If the student is not yet registered as a student with a disability, s/he should contact the Office of Student Accessibility Services.

References:

(To refresh math4/5600)
a. Numerical Analysis, 9th Edition by Burden and Faires, Brooks/Cole Pub Co; ISBN-13: 978-0-538-73351-9; ISBN-10: 0-538-73351-9.
https://fac.ksu.edu.sa/sites/default/files/numerical_analysis_9th.pdf
b. An Introduction to Numerical Methods and Analysis, 2nd Edition, by James F. Epperso, ISBN-13: 978-1118367599, ISBN-10: 1118367596, Wiley, 2013
Other references and supplement materials will be posted at the Blackboard.

Coursework submission schedule (subject to change)

HW	Due Date	Score	Readings	Due Date	Score
#1	01/26/2022		#1	04/13/2022	
#2	02/09/2022		#2	04/20/2022	
#3	02/23/2022				
#4	03/23/2022				
#5	04/06/2022		Final Project	04/25/2022	