## MAT 494 – Topic: Computational Methods for Image Processing (Spring 2024)

Class will meet weekly on Monday and Wednesday at 12:00-1:15pm in Tempe - WXLR A113.

**Instructor:**
Dr. Malena Espanol
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**Textbook:**
Deblurring Images: Matrices, Spectra, and Filtering, by Hansen, Nagy, and O'Leary, SIAM 2006.
Notice: pdf files of the chapters of the book are available through ASU Library.

**Course Objective:** The processing of images is very important for science and engineering applications. This course introduces computational techniques for manipulating and enhancing digital images through matrix formulations and linear algebra tools. It is designed for students with basic knowledge of linear algebra and some programming experience. Interdisciplinary projects are the integral part of this course.

**Requirements:** Linear Algebra MAT 342 or Applied Linear Algebra MAT 343, Multivariate Calculus, and a programming course.

This course would be relevant for students in the BS CMS degree, BS Stats degree, BS Data Science, and also for students in CS programs. Honors credit will be offered.

**Contents:**
1: The Image Deblurring Problem
2: Manipulating Images in MATLAB
3: The Blurring Function
4: Structure Matrix Computations
5: SVD and Spectral Analysis
6: Regularization by Spectral Filtering
7: Color Images, Smoothing Norms, and Other Topics

**Grades:**
100 pts Homework Assignments
100 pts Final Project

Final grades will be determined as follows: A: 90% and above; B: 80%-90%; C: 70%-80%; D: 60%-70%; E: below 60%

Matlab is the preferred computer language for this class which will be used to illustrate examples in class. However, students are welcomed to use Python or any other programming language of their choice.