

Course Information: EE 528 (Digital Image Processing)

- Instructor: Dr. Namrata Vaswani, **Email:** namrata AT iastate.edu **Office:** 3121 Coover Hall
- Class webpage: <http://www.ece.iastate.edu/namrata/EE528/>
- Location: 1120 Sweeney
- Time: 9:30 - 10:50 am, Monday and Wednesday.
- Office Hours: 11-12 Tuesday, 2-3 Friday, Location: 3121 Coover Hall
- **Textbook:** A. K. Jain, Fundamentals of Digital Image Processing
- Reference Texts
 - Milan Sonka et al: Image Processing, Analysis and Computer Vision
 - Gonzalez and Woods: Digital Image Processing
 - Tekalp, Digital Video Processing
 - More to be posted.
- **Grading policy:**
 - Homeworks (mostly MATLAB, some numerical) : 15%
 - Project (with two parts, 20% each) : 40%
 - * Part 1: Reading a few papers (or a book), and presenting/comparing a few approaches in detail + briefly discussing other work (3-4 approaches).
 - * Part 2: Choose one or two approaches, implement and analyze results. Emphasis on being able to explain what results you are getting and why.
 - * Submit: Report, MATLAB code, half hour talk after each part.
 - Midterm Exam or Project (with 2 parts, same pattern as above): 45 %
- *Disability accommodation: If you have a documented disability and anticipate needing accommodations in this course, please make arrangements to meet with me soon. You will need to provide documentation of your disability to Disability Resources (DR) office, located on the main floor of the Student Services Building, Room 1076, 515-294-7220.*
- **Prerequisites:** EE 224 (Signals and Systems), EE322 (Undergraduate probability), Linear Algebra, Calculus, MATLAB
 - Even though 424 is listed as a prerequisite, it is not absolutely necessary. But 224 and 322 are necessary.
 - Should know MATLAB well (can be picked up in 2 days if you know some programming).

Outline of Syllabus

- What is Image Processing?
- Review of Signal processing, Matrix algebra, Probability/Statistics (Chapter 2)
- Image “Processing” topics (**parts** of Chapters 4,5,6,7,8)
 - Sampling and Quantization
 - Image Transforms
 - Stochastic Models for Images
 - Image Enhancement
 - Image Filtering
 - Image Restoration
- Image Analysis/Computer Vision (Chapter 9 & Sonka’s book & papers)
 - Edge detection, Boundary Extraction
 - Segmentation, Level Set Method (brief introduction)
 - Registration, Tracking
- Reconstruction from Projections (Chapter 10 & papers)
 - Radon transform, Fourier-slice, Filtered back projection, recent methods)
- Estimation topics (in the context of restoration, registration, segmentation, tracking)
 - Bayesian cost functions
 - Least squares estimation
 - EM algorithm, Alternating minimization (or ICM)
 - Monte Carlo methods (importance sampling, MCMC, annealing, sequential IS)
 - Kalman filter, Particle filter
- Object Recognition (if time permits, brief discussion)
- Image, Video compression (if time permits, else only JPEG)