

ECE 468 – Digital Image Processing

Catalog Description: Introduction to digital image processing including fundamental concepts of visual perception, image sampling and quantization, image enhancement in spatial and frequency domains (through 2D Fourier transform), image restoration, and color image processing. Implementation of algorithms using Matlab Image Processing Toolbox.

Credits: 3 **Terms Offered:** Fall

Prerequisites: ECE 351, ECE 352

Courses that require this as a prerequisite: ECE 568

Structure: Three 50-minute lectures per week

Instructors: S. Todorovic

Course Content:

- CCD and CMOS imaging sensors
- Color imaging sensors
- Color de-mosaicking
- Image sampling and quantization
- Image equalization
- Histogram processing
- Image enhancement, both in the spatial domain and in the frequency domain (through 2D Fourier transform)
- Ideal, Gaussian, and Butterworth 2D lowpass, highpass, bandpass, and bandreject filters
- Noise characterization, periodic noise and random noise
- Image restoration
- 2D de-convolution,
- Inverse filtering, Wiener filtering, constrained least squares filtering
- Geometric transformations
- 2D interpolation
- Image registration and mosaicking
- Elements of human visual perception
- Fundamentals of color image processing (filtering, enhancement, de-noising)

Measurable Student Learning Outcomes:

At the completion of the course, students will be able to...

1. **Acquire** the fundamental concepts of a digital image processing system (ABET outcomes i, j, k, l, m)
2. **Identify and exploit** analogies between the mathematical tools used for 1D and 2D signal analysis and processing (ABET outcomes a, b, e, n)
3. **Analyze** 2D signals in the frequency domain through the Fourier transform (ABET outcomes b, m, n)

4. **Design and implement** with Matlab algorithms for digital image processing operations such as histogram equalization, enhancement, restoration, filtering, and de-noising (ABET outcomes a, c, e, k, l, m, n)

Learning Resources:

- *Digital Image Processing*, 2nd Edition, by Gonzalez and Woods, Prentice Hall, 2002.
- Matlab Image Processing Toolbox

Students with Disabilities:

Accommodations are collaborative efforts between students, faculty and Services for Students with Disabilities (SSD). Students with accommodations approved through SSD are responsible for contacting the faculty member in charge of the course prior to or during the first week of the term to discuss accommodations. Students who believe they are eligible for accommodations but who have not yet obtained approval through SSD should contact SSD immediately at 737-4098.

Link to Statement of Expectations for Student Conduct:

<http://oregonstate.edu/admin/stucon/achon.htm>

Revised: 5/25/07