

# CS 345/545: Image Processing – Fall 2015

TTH 3:35-5:00 PM in JHSW 316

---

<b>Course Instructor</b>
<b>Brent Dingle, Ph.D.</b>
Math, Stats, and Computer Science
Jarvis Hall Science Wing 219
Office Hours: TBA
dingleb@uwstout.edu

**Course Info:** <http://www.uwstout.edu/lit/learn/index.cfm> (D2L/Learn@UW-Stout login)

**Text Books:** None Required  
Recommended: *Digital Image Processing, 3rd Ed.*, R.C. Gonzalez & R.E. Woods, 2008  
*The Digital Image*, D. House, 2002

**Software:** **A text editor:** Notepad will suffice in Windows. TextEdit will suffice in Mac OS X.  
*Aside: Notepad++ has worked well for the students in other/previous courses.*  
**Web browsers:** Firefox, Safari, Chrome, IE, or Opera

## General Description

This class presents and discusses the theory and applications of digital image processing. Topics include: mathematical foundations and algorithms for enhancement, restoration, compression, segmentation and reconstruction from projections. Focus will be given to: Tools and techniques for the generation, handling and analysis of two-dimensional images, warping, color space operations, enhancements, filtering, and manipulation.

**Prerequisites:** MATH-255 and MATH-275 and CS-244 and STAT-332, or consent of instructor

## Summary of Objectives and Learning Outcomes

By the end of this course, students should be able to:

1. Understand the mathematical basis for image processing methods.
2. Be able to implement image enhancement, compression, restoration and segmentation algorithms.
3. Be able to select and apply appropriate image processing techniques in one or more application areas.

Graduate students shall in addition be able to:

4. Acquire a broad understanding of the theoretical basis of image processing

## Course Outline

- I. Digitization and Sampling Methods
- II. Image Enhancement
  - a. Gray Scale Modification
  - b. Sharpening
  - c. Smoothing
- III. Image Compression
  - a. 1D and 2D Fourier Transformation
  - b. Restoration in the Frequency Domain
- IV. Segmentation
  - a. Edge Detection
  - b. Thresholding
- V. Reconstruction
- VI. Applications

## Performance Evaluation

Tentatively grading will be based on:

- Homework: 15%
- Semester Project: 75% (proposal: 5% + midpoint: 30% + final: 40%)
- Overall Performance/Quizzes/Other: 10%

Most homework will involve writing and modifying software.

Code will be expected to be written in HTML5, JavaScript, and CSS.

With instructor approval code may be written in Matlab or in C++ using OpenGL libraries.

Students must also complete a final (programming) project of their own design. Expect there to be at least 3 grading points on this semester project: initial proposal, “half-way” point, and final.

All work will be graded on a 100 point scale, using the following scheme:

- 100 = Extraordinary work (rarely awarded)
- 90 to 95 = Meets all requirements and is particularly well done
- 80 to 85 = Satisfactory, meets all requirements, no errors
- 70 to 75 = Mostly ok but has errors or does not meet all requirements
- 0 to 65 = Unsatisfactory

Due dates and times will be announced with each homework assignment. Late penalties may be applied.

Final Grade:		
A weighted grade of:	96% or above will earn you at least an A	80% or above at least a B-
	92% or above at least an A-	76% or above at least a C+
	88% or above at least a B+	72% or above at least a C
	84% or above at least a B	56% or above at least a D-

**Please note the usage of the words “at least”**

## Classroom Etiquette

Students are expected to attend every class. Students should bring their laptops to every class. The student, present or not, is responsible for obtaining material and information distributed and presented on all class days. All “extra” electronic devices should be set to mute or off before coming to class. This includes, but is not limited to, cell phones, iPods, pagers, PDAs, and laptop volume control. You (the student) may use your laptop (or other electronic devices) as required for classroom activities. However, the instructor may at any time, for any reason, require, on an individual basis, usage of any device be discontinued. *No photos, video or audio recording is permitted without prior written permission from the instructor.* Smoking of any kind in class is prohibited. Disruptive behavior may result in the instructor requiring its direct and indirect source(s) to leave the classroom for the day. The consequences of which remain the burden of the source(s). Arriving late, leaving early, or sleeping in class is at the student’s own risk as are the consequences thereof.

## Missing Class

This should be avoided. The consequences of any absence shall be determined solely by the instructor on a case by case basis. In general missing a class will result in zero points being awarded for any activities that took place during the missed class period. However, discussion with the student may greatly influence the consequences. This does not imply the instructor must find consequences that the student likes or agrees with. However, more lenient consideration may be given if the instructor is informed BEFORE the absence occurs. Further, the nature of any absence can only be taken into account if and when discussion about the absence occurs.

The responsibility of initiating discussion over any absence falls to the student. In general the student will have seven days after the absence before any consequence of the absence becomes permanent. However, near the end of the semester, or as a necessity of providing timely reporting of grades, or for other (similar) reasons, this grace period may be shortened without notice.

### Academic Dishonesty

Students are expected to do their own work unless specifically directed otherwise by the instructor. Plagiarism and cheating are serious offenses and may be punished by failure on assignment, failure on exam, failure in course, and/or expulsion from the University. For more information, refer to the [university policy](#).

### Incompletes and Withdrawals

By [university policy](#), incompletes will only be given in circumstances that do not allow a student to finish the class, and only if it is beyond the student's control. Poor performance is not a condition for an incomplete. Withdrawals (dropping the class) will be allowed in accordance with [university policy](#).

### Special Needs

UW-Stout strives for an inclusive learning environment. If you (the student) anticipate or experience any barriers related to the format or requirements of this course you should meet with the instructor to discuss ways to ensure full access. If you determine that additional disability-related accommodations are necessary please contact the Disability Services office (206 Bowman Hall, 232-2995, [www.uwstout.edu/disability](http://www.uwstout.edu/disability)).

### Important Dates:

*This is a tentative schedule and may change – including addition or deletion of items.  
Check with your instructor(s) as the semester progresses.*

Sep 10	First Day of Class (Thursday)
Dec 15	Last class day (Tuesday) – any and all remaining work due
	Check University Calendar for “Final Exam Day”