

EE 7150/CEG-7580 – Digital Image Processing
Fall-2021
Department of Electrical Engineering
Wright State University

Important: Per university rules, all students in any WSU premises are required to wear MASKS that includes during class times until further notice.

Instructor: Arnab Shaw
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Class Time: Mon, Wed: 6:10 PM -- 7:30 PM, Russ-153 + Online Via Pilot [Collaborative Ultra](#)

Office Hours: Mon, Wed: 4:00 PM -- 5:00 PM; Online students can contact via [Discord](#) and by appointment during office hours. Contact via email/mobile at any other times.

Text: [Digital Image Processing, 4th ed., Rafael C. Gonzalez and Richard E. Woods, Prentice Hall, Upper Saddle River, NJ, 2018.](#)

Book Site: [Student Support Materials](#), [Solutions Manual](#)

Prerequisite: Undergraduate level Signal Processing (and/or Linear Systems), Matlab basics

Recommended Software: Image Processing Toolbox, Student version of [MATLAB \(Available Free of cost from CATS at Wright State\)](#).

Grading

Computer Project Reports and Codes	70%
Final Project Report and in-class Presentation (5:45 PM -- 7:45 PM, Wednesday, Dec 8, 2021)	30%

Important: All students must present online 5:45 PM -- 7:45 PM on Wednesday, Dec 8, 2021 or during class times in the previous week of November 29, 2021

<u>Course Topics</u>	<u>Chapters</u> <u>Gonzalez/Woods</u>	<u>Sections</u> <u>4th Edition</u>
Introduction	1	1.1-1.5
Digital Image Fundamentals	2	2.1 - 2.5 (part)
Spatial Filtering (smoothing - lowpass, sharpening – highpass, other filters)	3	3.1- 3.8
Frequency Domain Filtering	4	4.3 - 4.10
Image Restoration & Reconstruction	5	5.1-5.11 (parts)
Wavelets & Multiresolution	6	6.1- 6.10
Color Image Processing	7	7.1 - 7.8
Image Compression	8	8.1 - 8.11 (parts)
Morphological Image Processing	9	9.1- 9.5 (parts)
Image Segmentation, Edge Detection, Thresholding & Region Detection	10	10.1 -10.4, 10.7
Feature Extraction	12	12.1 - 12.4 (parts)

Computer Project Assignments – Online submissions Via Pilot – CODES MUST RUN

- **All students must complete 9 Assigned Project Topics (See below Due Dates for Report/Codes):**
 - **70% of course grade**
 - 1. Image Processing Fundamentals: Intensity Level, Zooming, Shrinking (Sept 7, 2021)
 - 2. Image Enhancement & Histogram Equalization (Sept 17, 2021)
 - 3. Spatial Filtering: Image Smoothing, Sharpening, Denoising (Sept 27, 2021)
 - 4. Frequency Domain Filtering: Image Smoothing, Sharpening, Denoising (Oct 7, 2021)
 - 5. Wavelets & Multiresolution Processing, Image Denoising (Oct 18, 2021)
 - 6. Image Compression using Transform Coding, Jpeg and Wavelet Coding (Nov 1, 2021)
 - 7. Image Restoration: Removal of Salt & Pepper Noise, Periodic Noise & Color Image Processing: Pseudo Coloring (Nov 12, 2021)
 - 8. Boundary Extraction: Morphological processing and Set Operations (Nov 29, 2021)
 - 9. Segmentation: Edge Detection, Smoothing and Image Thresholding (Nov 29, 2021)
- **Individual Final Projects (Due Dates for Report & Codes - Dec 9, 2021):**
 - **30% of course grade**
 - **Each student will select an image processing topic of his/her own interest and choice**
 - **Objective:** Replicate results published in a **reputed Image Processing Journal**
 - Past student topics, Sample Final Reports and Presentations are available on Pilot
 - **Topic Abstract is due from all students by the end of 8th week, Oct. 15, 2021**

Resources on the Web

Image Processing courses are taught in many universities in the world.

- [Stanford EE-368/CS-232](#) (single and group [projects](#))

Supplementary Materials

- [A blog on Matlab usage for Digital Image Processing](#)
- Mathworks' [Online Tutorial](#) on Matlab Image Processing Toolbox
- [Tutorial](#) on Matlab Image Processing Toolbox
- Java Applets [demos on Image Processing](#)
- [JPEG Standards](#)
- [JPEG 2000](#)

Image Processing Journals of Interest (Access online via WSU Library)

[IEEE Transactions on Image Processing](#)

[IEEE Transactions on Pattern Recognition](#)

[IET Image Processing](#)

[Pattern Recognition](#)

[Pattern Recognition Letters](#)

[Journal of Mathematical Imaging and Vision](#)

[Computer Vision Graphics and Image Processing](#)

[Journal of Electronic Imaging](#)

Academic Integrity

Student-teacher relationships are built on trust. For example, students must trust that teachers have made appropriate decisions about the structure and content of the courses that they teach, and teachers must trust that the assignments which students turn in are their own. Acts which undermine this trust undermine the educational process. It is the policy of Wright State University to uphold and support standards of personal honesty and integrity for all students consistent with the goals of a community of scholars and students seeking knowledge and truth. Furthermore, it is the policy of the university to enforce these standards.

The following recommendations are made for students:

1. Be honest at all times.
2. Act fairly towards others. For example, do not seek an unfair advantage over others by cheating with or by looking at other individual's work during examinations or computer assignments.
3. Take group as well as individual responsibility for honorable behavior. Collectively, as well as individually, make every effort to prevent and avoid academic misconduct, and reports acts of misconduct that you witness.
4. Know the policy -- ignorance is no defense. Read the policy contained in the student handbook. If you have any questions regarding academic misconduct, contact your instructor.

Students are encouraged to get together in small study groups to discuss the course topics and ungraded homework problems. However, students must work on all graded course assignments and examinations on an individual basis.

What IS allowed: Students are allowed to discuss the general requirements of assignment to make certain that they understand the problem and its goal. Students are allowed to ask another student (who has completed the assignment) for (brief) help with a syntax error or other minor problem that does not require extensive exploration of the solution. If another student asks you for help debugging AFTER you have finished the assignment, then you may help them briefly, but you may NOT show them your solution. Students may go to their TA, or the instructor for more detailed help. If you work with other student in an allowed manner, you are required to acknowledge the collaboration and its extent in the assignment. This will allow the instructor to comment on and correct the degree of collaboration if necessary. Unacknowledged collaboration will be considered dishonest.

What IS NOT allowed: Students may NOT work together on assignments. Students may NOT use code created by other students. You may NOT look at code created by another student (even to debug) until after you have completed the assignment yourself. Students absolutely may NOT turn in someone else's solution with simple cosmetic changes (say, changed variable names) to the solution -- this is a gross breach of academic integrity and will result in a failing grade for the course. You are responsible for ensuring that other students do not have access to your work - do not give another student access to your files, do not email your code to another student, do not leave printouts in the recycling bin or printer, do not leave your workstation unattended, etc. If you suspect that your work has been compromised notify your instructor immediately.

Conduct for Examinations/Quizzes: The academic code demands that no student should have an unfair advantage over any other student during examinations. Thus, it is strictly forbidden for any student to refer to information from previous offerings of this course unless this information is provided by the instructor to all students fairly. Thus, the use of test banks of previous quizzes or asking questions about examinations or laboratory assignments to prior students is strictly forbidden.