Course Information
        CSC481: Introduction to Image Processing
        Fall 2017
        Wednesday 5:45PM-9:00PM
        Loop Campus, CS&TC 00218
        Course Management System: http://D2L.depaul.edu

Instructor Information
        Instructor: Daniela Stan Raicu
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        Office Hours: Wednesday, Thursday, 4:15-5:00pm, 9:00-9:45pm
                            Tuesday, 10:00-11:30am
                            Other times by appointment
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Course Description
The technological revolution has allowed to capture, display, store and process images for almost any domain including astronomy, biomedical imaging, surveillance and remote sensing, computer vision (e.g. robots, license plate readers, and tracking human motion), and security and digital rights management (e.g. watermarking, biometrics). Some important examples of image processing tasks are cleaning up noisy and blurred images due to imperfect imaging sensors and illumination issues, detection of objects for recognition and tracking, and compressing images for transmission and sharing via social media and video watching.

This course will provide both the theory behind the fundamental image processing tasks and the hands-on training to develop, implement, evaluate and interpret key processing tasks in practice. Example images from publically available datasets for specific applications and imaging research projects will be utilized to demonstrate both theory and practice. The image processing techniques will be implemented using MATLAB, the most used software package in image processing. Real world hands on experience is one of the highlights of this course, in which students are expected to implement various image processing techniques in several smaller assignments and a bigger quarter long project.

The topics covered in the course include:
- components of an image processing system and its applications
- elements of visual perception
- sampling and quantization
- image filtering and enhancement
- color spaces and transformations
- segmentation
- morphological image processing.

The course is a prerequisite for more advanced Visual Computing (VC) courses (CSC382/482: Image Analysis and its Applications, CSC528: Computer Vision). There are opportunities for research assistantships for the students having the best final projects.

Course Learning Goals
At the end of the course, students should be able to:
- Understand the basic techniques of image processing
- Understand the connection between the three areas that form visual computing: image processing, image analysis and computer vision

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- Identify image processing challenges and solutions for problems from different domains including military, computer gaming, homeland security, microarrays, web, education and training, and fashion and design.
- Apply image processing techniques to solve these challenges
- Acquire the skills needed for a job in image processing.

Textbooks and printed resources
Digital Image Processing, Fourth Edition, Gonzalez and Woods, ISBN 13: 9780133356724
http://www.prenhall.com/gonzalezwoods
College bookstore and on-line option direct link: http://www.facultybookshelf.org/course/12529

Prerequisites
Calculus or Linear Algebra

Grading
The homework/programming assignments will be worth 50% of the course grade. Instead of a midterm and a final exam, there will be a literature review and a final project for this course. The literature review will be worth 10% and the final project will be worth 40% (proposal 5%, presentation 10%, and report 25%). Final presentations and demos will be done on both November 8th and November 15th. The final report will be due on November 17th.

The summary of the weights of each assignment for contributing to the final grade is as follows:

Assignment	Weight in final grade
Homework & Programming Assignments	50%
Literature Review	10%
Final Project	40%

The final grade will be assigned according to the following scale:

Percentage Grade	Letter Grade	Manner of fulfillment
95-100	A	Excellent
90-94	A-	
85-89	B+	Very Good
80-84	B	
75-79	B-	
70-74	C+	Satisfactory
65-69	C	
60-64	C-	Poor
55-59	D+	
50-54	D	
0 50	F	

Software
The image processing techniques will be implemented using MATLAB, the most used software in image processing. The software will be available for use in the CDM labs and through the CDM Terminal Services.

MATLAB will be taught in class; there will also be three hands-on lab sessions scheduled on September 13th, September 27th, and October 25th (as needed). The sessions will be recorded and available for both in-class and DL students.
MatLab homepage: http://www.mathworks.com/
Matlab user stories: http://www.mathworks.com/company/user_stories/

Homework/Programming Assignments and Final Project Policies
<u>Homeworks</u>

There will be 5 homework/programming assignments, which are due at the beginning of class one or two weeks after they are assigned. Late assignments will be accepted up to one lecture later than the assigned due date with a 25% penalty this penalty will be assessed in full to assignments turned in from the end of class on the day that the assignment is due up until the beginning of next lecture. No assignments will be accepted beyond the beginning of class one lecture beyond the due date.

The assignments must be submitted online on the D2L site at https://D2L.depaul.edu. Only legible, organized homework which shows your work will be graded. Include your name, section number, date, and homework number on the first page of your assignment. It is your responsibility to check that you uploaded the homework/project files correctly and by the deadline; make sure that you always keep a copy of your submission.

Extra credit points will be given for additional problems in assignments and active participation in the lectures and Discussion Forum.

<u>Paper Review:</u>
Throughout the quarter, the students will be also provided with a list of research papers related to the image processing concepts discussed in class. At least two of these papers will be discussed in class; each student will have to review these papers and participate in the in-class discussions.

The paper readings will be selected from well known conferences in image processing such as IEEE International Conference on Image Processing (ICIP), International Conference on Computer Vision and Pattern Recognition (CVPR), and the journal of IEEE Transactions on Image Processing.

<u>Final Project</u>

The final project for this class is more extensive analysis task, chosen by you from among the topics we discuss. The purpose of the final project is to demonstrate your ability to apply the knowledge and the techniques learned during this course. Final projects will include a presentation to the rest of the class at the end of the quarter, in place of a final exam. As part of your final project, you will also be asked to critique your classmates' projects. These critiques will be collected by me, collated, and passed on anonymously to the presenter.

Whenever it is possible, it is recommended that the DL students attend the final presentations to participate in the live discussions of the final projects and to complete critiques of the other projects. However, appropriate accommodations through SKYPE will be arranged for the DL students not being able to give the presentations in class; the DL students will still have to submit their critiques on the other projects.

<u>Deliverables for the final project:</u>

Proposal (October 11th): One page proposal describing the problem, the proposed approach, and at least three references other than text book or class notes.

Presentation (November 8/15th): Each project is to be presented using PowerPoint, and the PPT file will have to be submitted to be published on course web site.

Report (November 17th): The report will be written in a format of a paper (abstract, introduction, literature review, methodology, results, discussion, conclusions and future work). The literature review for the final report consists of reading and summarizing about 5 to 6 published papers on the review topic. While the

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internet can serve as a good source of information, the DePaul Library also has extensive holdings, most of them available electronically.

Attendance
It is expected that you will attend every class; it is the single most important action you can take in mastering the course objectives. You are responsible for all material covered, assignments delivered or received, and announcements made in class sessions that you miss. For distance learning students, this means viewing the classes in a timely manner, participate in the discussion forum, and being sure to email or call in any questions that you have.

For online students:
Recordings of each lecture will be available a few hours after the "live" class, and can be found at the course website https://d2l.depaul.edu. Online students are expected to watch the lectures every week and to keep up with the course information posted on the course website.

Email
Email is the primary means of communication between faculty and students enrolled in this course outside of class time. Students should be sure their email listed under "demographic information" at http://campusconnect.depaul.edu is correct.

Changes to Syllabus
This syllabus is subject to change as necessary to better meet the needs of the students. Significant changes are unlikely, and will be thoroughly addressed in class. Minor changes, especially to the weekly agenda, are possible at any time. If a change occurs, it will be thoroughly addressed during class and posted under Announcements in D2L.

Class Cancellation
Unless DePaul University closes because of weather, we will have class.

Cell Phones/On Call
 If you bring a cell phone to class, it must be off or set to a silent mode. Should you need to answer a call during class, students must leave the room in an undisruptive manner. Out of respect to fellow students and the professor, texting is never allowable in class. If you are required to be on call as part of your job, please advise me at the start of the course.

School policies:

Online Course Evaluations
Instructor and course evaluations provide valuable feedback that can improve teaching and learning. The greater the level of participation, the more useful the results. As students, you are in the unique position to view the instructor over time. Your comments about what works and what doesn't can help faculty build on the elements of the course that are strong and improve those that are weak. Isolated comments from students and instructors' peers may also be helpful, but evaluation results based on high response rates may be statistically reliable (believable). As you experience this course and material, think about how your learning is impacted. Your honest opinions about your experience in and commitment to the course and your learning may help improve some components of the course for the next group of students. Positive comments also show the department chairs and college deans the commitment of instructors to the university and teaching evaluation results are one component used in annual performance reviews (including salary raises and promotion/tenure). The evaluation of the instructor and course provides you an opportunity to make your voice heard on an important issue – the quality of teaching at DePaul. Don't miss this opportunity to provide feedback!

Academic Integrity and Plagiarism
This course will be subject to the academic integrity policy passed by faculty. More information can be found at http://academicintegrity.depaul.edu/.
The university and school policy on plagiarism can be summarized as follows: Students in this course should be aware of the strong sanctions that can be imposed against someone guilty of plagiarism. If

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proven, a charge of plagiarism could result in an automatic F in the course and possible expulsion. The strongest of sanctions will be imposed on anyone who submits as his/her own work any assignment which has been prepared by someone else. If you have any questions or doubts about what plagiarism entails or how to properly acknowledge source materials be sure to consult the instructor.

Withdrawal
Students who withdraw from the course do so by using the Campus Connection system (http://campusconnect.depaul.edu. Withdrawals processed via this system are effective the day on which they are made. Simply ceasing to attend, or notifying the instructor, or nonpayment of tuition, does not constitute an official withdrawal from class and will result in academic as well as financial penalty.

Retroactive Withdrawal
This policy exists to assist students for whom extenuating circumstances prevented them from meeting the withdrawal deadline. During their college career students may be allowed one medical/personal administrative withdrawal and one college office administrative withdrawal, each for one or more courses in a single term. Repeated requests will not be considered. Submitting an appeal for retroactive withdrawal does not guarantee approval.

College office appeals for CDM students must be submitted online via MyCDM.
The deadlines for submitting appeals are as follows:
Autumn Quarter: Last day of the last final exam of the subsequent winter quarter
Winter Quarter: Last day of the last final exam of the subsequent spring quarter
Spring Quarter: Last day of the last final exam of the subsequent autumn quarter
Summer Terms: Last day of the last final exam of the subsequent autumn quarter

Excused Absence
In order to petition for an excused absence, students who miss class due to illness or significant personal circumstances should complete the Absence Notification process through the Dean of Students office. The form can be accessed at http://studentaffairs.depaul.edu/dos/forms.html. Students must submit supporting documentation alongside the form. The professor reserves the sole right whether to offer an excused absence and/or academic accommodations for an excused absence.

Incomplete
An incomplete grade is a special, temporary grade that may be assigned by an instructor when unforeseeable circumstances prevent a student from completing course requirements by the end of the term and when otherwise the student had a record of satisfactory progress in the course. CDM policy requires the student to initiate the request for incomplete grade before the end of the term in which the course is taken. Prior to submitting the incomplete request, the student must discuss the circumstances with the instructor. Students may initiate the incomplete request process in MyCDM.
•   All incomplete requests must be approved by the instructor of the course and a CDM Associate Dean. Only exceptions cases will receive such approval.
•   If approved, students are required to complete all remaining course requirement independently in consultation with the instructor by the deadline indicated on the incomplete request form.
•   By default, an incomplete grade will automatically change to a grade of F after two quarters have elapsed (excluding summer) unless another grade is recorded by the instructor.
•   An incomplete grade does NOT grant the student permission to attend the same course in a future quarter.

Students with Disabilities
Students who feel they may need an accommodation based on the impact of a disability should contact the instructor privately to discuss their specific needs. All discussions will remain confidential.
To ensure that you receive the most appropriate accommodation based on your needs, contact the instructor as early as possible in the quarter (preferably within the first week of class), and make sure that you have contacted the Center for Students with Disabilities (CSD) at:
Student Center, LPC, Suite #370
Phone number: (773)325.1677

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Fax: (773)325.3720
TTY: (773)325.7296