

# CSCI 508 / EENG 508 Syllabus

## Advanced Topics in Perception and Computer Vision

### Instructor

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Office hours: T 11-12, R 10-11. Other times, if I'm not having a meeting, please feel free to stop by.

### Meetings

- Class is held every Tuesday and Thursday in BB316B from 12:30 pm - 1:45 pm.
- Occasionally there are outside talks and seminars related to this course, which I encourage you to attend (see <http://eecs.mines.edu/eecs.php/eventsAndNews/calendar>).

### Web Sites

- The main course website is <http://eecs.mines.edu/Courses/csci508/>. Visit this often, as it will contain lecture slides, homework assignments and solutions, labs, grades, etc.
- Please use Piazza to ask questions about the material – this is often the quickest way to get help. Go to <http://piazza.com/> to sign up.

### Description (from Bulletin)

This course covers advanced topics in perception and computer vision, emphasizing research advances in the field. The course focuses on structure and motion estimation, general object detection and recognition, and tracking. Projects will be emphasized, using popular software tools.

### Prerequisites

The prerequisite is the course "Introduction to Computer Vision" (CSCI507/EENG507), or equivalent. Prerequisite topics include image formation, feature extraction, location estimation, and object recognition.

### Objectives

At the completion of this course, students will:

- Be able to review the literature on computer vision and create a critical review.
- Be able to design, develop, and evaluate algorithms for specific applications.
- Be able to use software tools to implement computer vision algorithms.
- Communicate (in oral and written form) methods and results to a technical audience.

### Computer Tools

Computer tools will be used frequently in class and for assignments:

- MATLAB is a very powerful and industry-standard tool. Although it is installed on the computers at school, having it on your own computer would enable you to work at home. It's a

great deal for students. For this class, I recommend getting the main system (\$49) and these toolboxes: Image processing (\$10), Computer Vision (\$10), Statistics & Machine Learning (\$10).

- We will also use the Open Source Computer Vision library (OpenCV), which is free from <http://opencv.org/>. This is a collection of algorithms written in C/C++ for various computer vision problems.

## Textbooks

- The required textbook is *Computer Vision: Algorithms and Applications*, by Richard Szeliski, Springer 2011. It is available electronically through the school's library at <http://link.springer.com/book/10.1007%2F978-1-84882-935-0>. You must be on campus or logged in via VPN to download the book.
- Optional texts:
  - *Digital Image Processing, 3<sup>rd</sup> ed*, by Gonzalez and Woods, Prentice Hall, 2008. A thorough and readable coverage of image processing techniques that are useful in computer vision.
  - *Visual Object Recognition*, by Grauman and Leibe, Morgan & Claypool, 2011. Overview of computer vision algorithms for visual object recognition and image classification. Available at <http://www.morganclaypool.com/doi/abs/10.2200/S00332ED1V01Y201103AIM011>.
  - *Computer Vision: Models, Learning, and Inference*, by Simon J.D. Prince, Cambridge University Press, 2012. Focuses on probabilistic models, learning, and efficient inference algorithms for computer vision. Available at <http://www.computervisionmodels.com/>.

## Assessment and Grading

Students will be assessed using the following elements.

- Homework assignments (35%). There will be a series of homework assignments, to be done individually. Homework is due by the beginning of class on the due date. Late assignments will be reduced in grade unless there is prior approval by the instructor.
- Final project (35%). A final project will be done in teams of two. See the course website for additional details.
- Paper reviews (10%). Periodically I will assign a paper to be read, with a critical review to be written and turned in.
- Labs (10%). Periodically there will be a hands-on lab assignment to be done in class. The lab assignment will be checked for completion in class and must be shown to the instructor to receive credit.
- Participation (10%). Students are expected to take part in class discussions, including posts on piazza.

There are no exams.

## Using Computers in Class

It's ok to follow along the lecture slides on the computer. However, checking your email, working on other non-class related materials, web-surfing, etc., are not appropriate activities for class time. It's a

huge distraction, not only to you but to the people around you. Please be respectful of your colleagues in class, and use the computers only for class activities.

## Collaboration Policy for Programming Projects in CS Courses

The following policy exists for all CS courses in the EECS department. This policy is a minimum standard; your instructor may decide to augment this policy.

- If the project is an individual effort project, you are not allowed to give code you have developed to another student or use code provided by another student. If the project is a group project, you are only allowed to share code with your group members.
- You are encouraged to discuss programming projects with other students in the class, as long as the following rules are followed:
  - You view another student's code only for the purpose of offering/receiving debugging assistance.
  - Students can only give advice on what problems to look for; they cannot debug your code for you.
  - All changes to your code must be made by you.
  - Your discussion is subject to the empty hands policy, which means you leave the discussion without any record [electronic, mechanical, or otherwise] of the discussion.
- Any material from any outside source such as books, projects, and in particular, from the Web, should be properly referenced and should only be used if specifically allowed for the assignment.
- To prevent unintended sharing, any code stored in a hosted repository (e.g. on GitHub) must be private. For group projects, your team members may, of course, be collaborators.
- If you are aware of students violating this policy, you are encouraged to inform the professor of the course. Violating this policy will be treated as an academic misconduct for all students involved. See the Student Handbook for details on academic dishonesty.

## Collaboration Policy for Homework

The following policy applies to homework assignments other than programming projects.

- You can discuss homework assignments with other students in the class, as long as the following rules are followed:
  - You view another student's work only for the purpose of offering/receiving assistance.
  - All work must be done by you.
  - Your discussion is subject to the empty hands policy, which means you leave the discussion without any record [electronic, mechanical, or otherwise] of the discussion.
- Any material from any outside source such as books, projects, and in particular, from the Web, should be properly referenced and should only be used if specifically allowed for the assignment.