

# Winter 2008: Advanced Artificial Intelligence

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**Office hours:** 14:00-15:00 on Monday/Wednesday or by appointment.

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**TA Office Hours:** by appointment.

**TA Office:** Learning Center, UC 153

**Meeting Time and Place:** Monday-Wednesday-Friday, 15:00-15:50. Room: Univ. Crossings 153

## Required Textbooks:

Russell and Norvig, *Artificial Intelligence: A Modern Approach*, Second Edition, the Prentice Hall Series in Artificial Intelligence.

## Other Suggested Textbooks:

Insert your favorite Introductory Statistics book here

## Other Resources:

### Course Homepage:

[http://gic1.cs.drexel.edu/wiki/Advanced\\_Artificial\\_Intelligence\\_%28Winter\\_2008%29](http://gic1.cs.drexel.edu/wiki/Advanced_Artificial_Intelligence_%28Winter_2008%29)

**Textbook Portal:** <http://www.cs.berkeley.edu/~russell/aima.html>

**Course Email List:** [cs380@lists.cs.drexel.edu](mailto:cs380@lists.cs.drexel.edu).

I will post (on the email list and on the web site) homework assignments and other announcements, and will keep a running list of the topics we have covered. If I post something to the email list, you are assumed to have read and understood the message.

**Course Objectives.** This course is the second in the undergraduate Artificial Intelligence track at Drexel University. You are assumed to know the core concepts of **search**, **knowledge representation** and **planning**; as well as programming in AI languages such as Lisp. This course will cover:

- *Uncertainty*, including how to represent it mathematically. Topics include a review of basic probability notation, B' Rule and how to use it.
- *Reasoning under Uncertainty*, including how to represent uncertain knowledge and perform exact and approximate inference with it. Topics include Bayesian networks, clustering algorithms, Markov chains, hidden Markov models, and Kalman Filters.
- *Decision Making*, including the basics of utility theory, game theory and decision theory. Topics include, POMDPs and value iteration.
- *Machine Learning*. Topics include decision trees, Computational Learning theory, neural networks, kernel-based methods and reinforcement learning.

**Pre-Requisites.** Students are **required** to have taken courses in Introductory Algorithms and Programming Languages; as well as Introductory Artificial Intelligence. A course in statistics would also be a big plus, though a comprehensive background in statistics is not assumed.

Students should also have a thorough understanding of algorithms and algorithm design techniques, the use and analysis of pseudo-code. Many of the homework assignments in the class will be highly mathematical—students should be well versed in proof techniques (proof by induction, contradiction, etc.) and the mathematics of recursion and summations. You should be intimate with all material in R& N Appendices A and B. If you have a statistics book, please consider dusting it off now.

**Lectures.** This list is tentative and will be modified at the instructor’s discretion. The first 1/2 of the class will cover uncertainty and decision making (Chapters 13-17); the second 1/2 will cover Learning (Chapters 18-21). A rough guide is as follows:

- Week 1 : Class Intro; R&N Chapter 13
- Week 2: R&N Chapters 13, 14.1-14.5; Homework #1 due
- Week 3: R&N Chapter 14.1-14.5, 15.1-15.4; Homework #2 due
- Week 4: R&N Chapters 16-17; Homework #3 due
- Week 5: Homework #4 due; Review for Midterm; Midterm
- Week 6: R&N Chapter 18
- Week 7: R&N Chapter 19; Homework #5 due
- Week 8: R&N Chapter 20; Homework #6 due
- Week 9: R&N Chapters 21
- Week 10: Wrap up; Homework #7 due
- Week 11: Final Exam

**Grading and Workload.** Subject to the constraints in the section **Honesty and Integrity**, the grades for the class will be computed as follows:

- 45%** Midterm and Final Exams (20% each)
- 45%** Homework/Programming Assignments (expect 7 assignments)
- 10%** Class participation and attendance

Class participation and attendance is important and accounts for 10% of the final grade. The final exam will be cumulative.

Grading levels are expected to be: 90='A', 80-89='B', 70-79='C', 60-69='D', 60='F'. An “A” grade requires excellence in all of the grading categories, with all homeworks completed in their entirety and handed in on the due date in class. A passing grade requires the demonstration of a minimum proficiency in each aspect of the class (exams, homework and programming).

There will homework and/or programming assignments due every other week. Assignments are designed with the expectation that an average student wishing to earn an average grade ('C' or 'B') should expect to spend 10 hours per week on this work. Programming assignments will require submission of source code in the language required of each assignment. Homeworks and the output or analysis of programming assignments must be LEGIBLE, submitted ON PAPER (stapled if there are multiple pages), BEFORE THE START OF CLASS the day it is due. Homeworks and programming assignments will not be accepted after 6:00PM on the date they are due. It is also assumed that students read the textbooks, documentation and web pointers provided over the course of the class.

**Honesty and Integrity (Formerly “Ways to Fail this Class”):** Here are the most direct ways to earn an “F” in this class: (1) ignore all of the programming assignments by not handing them in or by handing in projects that do not run, in an effort to get partial credit; (2) fail to hand in more than 50% of the homeworks; (3) miss any one exam or obtain less than 25% on all of the exams; (4) falsify results; (5) copy or brainlessly paraphrase answers from the Russell and Norvig homework solution guide which have been copied various places on line; (6) mis-represent another’s work as your own (i.e., plagiarism) or violate the course “Discussion and Collaboration Policy.”

There will be absolutely ZERO tolerance of instances of cheating or unscrupulous activity. Any *appearance* of such activity will be investigated. Automated software tools will be used to aide in any investigation. Suspected or verifiable occurrences of such activity will be immediately brought before the University Honor Board. Possible ramifications range from failure in the course to expulsion from the institution and loss of your degree privileges. The best way to avoid problems in this area is to *work to avoid all appearance of possible impropriety*. Specific suggestions include:

- Work alone on all project assignments; use only textbooks as references; turn your computer off while solving non-programming problems.
- Stick to auxiliary resources available through the course web page and the AIMA web page maintained by Professor Russell at Berkeley.
- Do not Google (tm) for answers to questions.
- Wikipedia is but one reference, use it only as a vehicle to find other primary sources (textbooks, papers, etc). Do not use it as a way to find answers.
- Attribute any libraries or source code from others you use when writing up your assignment.
- Ask the instructor BEFORE doing something that may possibly result in a problem. If you are not absolutely 100% sure, ASK.

**Discussion and Collaboration Policies.** All students should be familiar with the University’s policies on academic dishonesty, as well as those governing all aspects of our collegial life, as described in the University Handbook. Incidents of academic dishonesty will be brought to the honor board and face possible academic suspension or expulsion. While I encourage students to collaborate, all homework, proofs, and code submitted as part of assignments must be the student’s own (except as noted above).

**Makeup Exams.** There will be no makeup exams. To get credit for a missed exam, you will need a valid medical excuse. This means an official letter (including the dates of incapacitation for your illness), either from your private physician or from the University’s Health Center. If you have a valid medical excuse, I’ll give you credit for the missed exam based on your performance on the other assignments and exams.