# CS 416: AI and Robotics

College of Arts and Sciences Syllabus
August 5, 2016

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**COURSE INFORMATION**

**Credit Hours:** 3

**Course Description:** This course serves as an introduction to aspects of Artificial Intelligence applied to the robotics field. Students will learn different techniques to approach problems using simple robotics. Students will be expected to understand the main concepts, research for available resources, and participate in projects where these concepts will be applied.

**Course Prerequisites:** CS-400 and CS404

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**FACULTY INFORMATION**

**Instructor:** Francisco Iacobelli

**Office Location:** Lech Walesa Hall 3060

**Office Hours:** T:2:30-4:30; W:3:00-4:00; R:6:00-7:00

**Phone Extension:** 4728

**email:** f-iacobelli@neiu.edu

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**COURSE MATERIALS**

**Course Website:** desire2learn, piazza (`http://www.piazza.com`), and `http://www.fid.cl/courses/ai-robotics/www/`

**Textbook:** Thrun S, Burgard W, Fox D. (2006). Probabilistic Robotics.MIT Press

**When:** R: 7:05p - 9:45p.

**Where:** Fine Arts Center 108

**Conditions to take this course** :

- You will need to be able to write PDF files
- You will need to be proficient at using a terminal (command line interface)
- You will also need to learn python in the first two weeks
- Lastly, in terms of programming, reading and writing files is a must.
- **Homework Due: Thursdays BEFORE 11:59pm each week. No late work will be graded.**

**Time Expectations:** Expect to spend an average of 10 hours a week in this course. Some weeks will take more time than others. An average week may look like: 2.75 hours spent in class, plus two days working/studying for 3.12 hours. So, it is possible that if you leave your homework for the last day you will be working for 7 hours straight. I strongly recommend you spend, at least, two additional days on this course every week.

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## COURSE OBJECTIVES/STUDENT LEARNING OUTCOMES

**Objective and Learning Outcome:** This couse will introduce students to seminal algorithms in probabilistic algorithms for robotics. Students should be able to look at a problem that requires an intelligent robot and both (a) figure out appropriate techniques for a solution and (b) implement one of those techniques.

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## STUDENT TASKS/ASSIGNMENTS/REQUIREMENTS

### Assignemnts

- Get a robot up and running on the simulator
- Python programming homework
- Algebra/ Prob. Review
- Naive Bayes homework
- Simple HMM homework
- HMM with actuators homework
- Kalman Filter HW
- MDPs
- POMDPs

There will be four quizzes. The material will comprise whatever was reviewed between the previous quiz up to the last class before the quiz.

In addition, a midterm will be given.

### Grading Policies and Formulae

| Item | Weight |
|---|---|
| Assignment and Quizzes Average | 60% |
| Midterm | 20% |
| Final Project | 20% |

| Weighted Average | Course Grade |
|---|---|
| 90% or higher | A |
| 80% – 89% | B |
| 70% – 79% | C |
| 60% – 69% | D |
| 0% – 59% | F |

### Course Outline

Week by Week breakdown

Week 1: Introduction. Intelligent Robots, Simulator

Week 2: Mathematical Background (Algebra: Matrices)

Week 3: Mathematical Background II (Conditional Probabilities)

Week 4: Bayesian Filters

Week 5-6: Hidden Markov Models

Week 7-8: Kalman Filter and Gaussian Filters

Week 9: Nonparametric Fiters

Week 10: Robot Motion

Week 11: Robot Perception

Week 12: Localization

Week 13-14: Markov Decision Processes (MDPs)

Week 15-16: Probabilistic MDPs

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**COURSE POLICIES AND STATEMENTS**

**Absence Policy**

There is no absence policy.

**Academic Integrity**

By enrolling in this course, you are bound by the NEIU Student Code of Conduct:`http://www.neiu.edu/university-life/student-rights-and-responsibilities/student-code-conduct`. You will be informed by your instructor of any additional policy specific to your course regarding plagiarism, class disruptions, etc.

**ADA Statement**

Northeastern Illinois University (NEIU) complies with the Americans with Disabilities Act (ADA) in making reasonable accommodations for qualified students with disabilities. To request accommodations, students with special needs should make arrangements with the Student Disability Services (SDS) office, located on the main campus in room D104. Contact SDS via (773) 442-4595 or http://www.neiu.edu/university-life/student-disability-services.

**Campus Safety**

Web links to Campus Safety: Emergency Procedures and Safety Information can be found on NEIUport on the MyNEIU tab or as follows: `http://homepages.neiu.edu/~neiutemp/Emergency_Procedures/MainCampus/`.

**Late Work Policy**

There will be many assignments. All work MUST be submitted on their given due date or a grade of zero will be assigned. No late homework assignments will be accepted. Please begin assignments early to ensure that you finish them on time. All grades for each assignment will be posted online on D2L at most one week after the due date. All assignments are due Thursdays before 4:00p.m.

**Web Link to Emergency Information**

It is recognized that a safe university environment is a shared responsibility of faculty, staff, and students, all of whom are expected to familiarize themselves with and cooperate with emergency procedures. Emergency Procedures and Safety Information can be found on NEIUport on the MyNEIU tab or at:

**Main campus:** `http://www.neiu.edu/~neiutemp/Emergency_Procedures/MainCampus/`

**El Centro(English version):** `http://www.neiu.edu/~neiutemp/Emergency_Procedures/ElCentro/`

**El Centro(Spanish version):** `http://www.neiu.edu/~neiutemp/Emergency_Procedures/ElCentro_Spanish/`

**CCICS:** `http://www.neiu.edu/~neiutemp/Emergency_Procedures/CCICS/`

**Chicago Teachers Center(CTC):** http://www.neiu.edu/~neiutemp/Emergency_Procedures/CTC/

**University Center at Grayslake:** http://ucenter.ehclients.com/pdfs/UCLCEmergencyPreparedness.pdf