INME 4850 Introduction to Robotics

University of Puerto Rico, Mayaguez

Syllabus and Policy

| Dr. Bob Williams williar4@ohio.edu | | Fall 2014 people.ohio.edu/williar4 | | | | | |
|---|--------------|---------------------------------------|--|--|--|--|--|
| Time & Venue 9:00 - 10:15 a.m. Martes Jueves | L-236A | 3 credit hours | | | | | |
| Office Hours 11:00 a.m. – 1:30 p.m. Martes Jueves | and by appoi | intment | | | | | |
| Required NotesBook Robot Mechanics, Dr. Bob Productions, 2014 | | | | | | | |
| Required Textbook none | | | | | | | |
| Dr. Bob's MATLAB Primer www.ohio.edu/people/williar4/html/PDF/MATLABPrimer.pdf | | | | | | | |
| Course Website www.ohio.edu/people/williar4/html/Courses.html | | | | | | | |
| NotesBook Supplement www.ohio.edu/people/williar4/html/PDF/Supplement4290.pdf | | | | | | | |
| Dr. Bob's Introduction to Robotics www.ohio.edu/people/williar4/html/PDF/IntroRob.pdf | | | | | | | |
| <u>Robot Animations developed at Ohio University</u> <u>www.ohio.edu/people/williar4/html/MechanismAnimations.html</u> | | | | | | | |
| Apague todos los teléfonos celulares y otros dispositivos electrónicos portátiles antes de entrar al salón de clases! | | | | | | | |

Turn off all cell phones and other portable electronic devices before entering the classroom!

<u>Mini-Projects</u> Your grade will be based entirely on equally-weighted mini-projects.

- Five **mini-projects** will be collected at the beginning of class on Tuesdays as shown in the schedule on the following page. Each mini-project will be assigned via e-mail at least one week before it is due. A **Memo** (see sample memo) summarizing the work must be the first page of each mini-project submission. *NO LATE ASSIGNMENTS WILL BE ACCEPTED!! SOLO WORK ONLY!* MATLAB use is required. Reports must be complete yet brief. All mini-projects are equally-weighted.
- There will be six **laboratory exercises** collected at the beginning of class on Tuesdays as shown in the schedule on the following two pages. The laboratory exercises are assigned here: www.ohio.edu/people/williar4/html/PDF/Labs4290.pdf. Each laboratory exercise is worth one mini-project grade. Please choose one partner for the lab assignments all semester.
- Also, each lab team must give an **oral presentation** on an interesting, current topic in robotics for one mini-project grade. This must be based on a journal article as assigned here: <u>www.ohio.edu/people/williar4/html/PDF/ResPapePres4290.pdf</u>. Your journal article must approved by Dr. Bob and presented to the class. No journal articles by me or any OU author.

Student Robotics Video Day

Each individual must present a robotics-related video in class (as scheduled on the following page) and turn in a detailed report on it the same day, L7, for another Lab grade.

Attendance

Full attendance is required. Class participation is expected. No assignment can be made up without a valid written OU excuse. Poor attendance *will* affect your grade.

Grading

All mini-projects are equally weighted. The single low grade will be dropped (you cannot use this rule unless you turn in all assignments including the last). You can only drop one from the first (weekly) category – you cannot drop any lab exercise report or the journal article presentation.

| 93.3-100 | 90-93.3 | 86.7-90 | 83.3-86.7 | 80-83.3 | 76.7-80 | 73.3-76.7 | 70-73.3 | 66.7-70 | 63.3-66.7 | 60-63.3 | < 60 |
|----------|---------|---------|-----------|---------|---------|-----------|---------|---------|-----------|---------|------|
| А | A– | B+ | В | B- | C+ | С | С- | D+ | D | D- | F |

INME 4850 Introduction to Robotics Fall Semester 2014 Schedule

| Week | Date | Day | Торіс | Notes | MP | Lab |
|------|-------|-----|--|-----------|-----|-----|
| 1 | 8/14 | J | Syllabus and Policy | Internet | | |
| 2 | 8/19 | М | Introduction | | | |
| | | J | Mobility | | | |
| 3 | 8/26 | М | Matrices, Vectors, spher to Cart, P-R-T | 1.3,4,5 | | |
| | | J | Rotation matrices steps | 2.1,2.2.1 | | |
| 4 | 9/2 | М | Rotation matrices, Quaternions | 2.2.1-2 | | L1 |
| | | J | Homo trans matrices, 2 interps | 2.3 | | |
| 5 | 9/9 | М | Homo review, 3rd interp, inv Homo | 2.3 | MP1 | |
| | | J | Transform equations | 2.3 | | |
| 6 | 9/16 | М | DH parameters | 2.4 | | L2 |
| | | J | DH parameters examples | 2.4 | | |
| 7 | 9/23 | М | Mayaguez Campus Anniversary Holiday | | | |
| | | J | Neighboring T derivation, screw pairs | 2.5 | | |
| 8 | 9/30 | М | FPK, examples | 2.5 | MP2 | |
| | | J | DARwIn, MATLAB robot graphics/animation | S2.5.5 | | |
| 9 | 10/7 | М | IPK intro, IPK graphical, model | 2.6 | | L3 |
| | | J | IPK planar 3R analytical | 2.6 | | |
| 10 | 10/14 | М | IPK MATLAB, videos, Cyl, block diag | 2.6 | MP3 | |
| | | J | Trajectory generation - 3rd and 5th | 2.8.1-2 | | |
| 11 | 10/21 | М | Trajectory generation - 2-3 rd via, 4th and 6 th | 2.8.3-5 | | L4 |
| | | J | Velocity kinematics, Velocity derivations | 2.8.6-7 | | |
| 12 | 10/28 | М | Jacobians, Forward solution, Resolved rate | 3.1-2 | MP4 | |
| | | J | Singularities, static joint torques, RR MAT | 3.2 | | |
| 13 | 11/4 | М | KRR solutions and resolved rate | 4.2 | | L5 |
| | | J | KRR homogeneous solution - self-motion | 4.3 | | |
| 14 | 11/11 | М | Veterans Day Holiday | | | |
| | | J | Parallel Robots Introduction | | | |
| 15 | 11/18 | М | Student Robotics Video Day | | MP5 | L7 |
| | | J | Journal article presentations | | | |
| 16 | 11/25 | М | Planar 3-R <u>P</u> R manipulator IPK | | | L6 |
| | | J | Thanksgiving Day Holiday | | | |