EE183DA (Winter 2019) Design of Robotic Systems I

Prof. Ankur Mehta ⟨mehtank@ucla.edu⟩

Syllabus (tentative)

EE 183DA

Lectures (4 hours per week): Advanced content in support of project. Varies according to design project set, determined by instructor. A sample collection of topics is included on the following page.

Laboratories (2 hours per week): Introduction to experimental apparatus and software. Varies according to design project set, determined by instructor. A sample collection of laboratory assignments is included below:

- Introduction to programming for hardware platforms
- Kinematics of chains and linkages
- Kalman filtering and state estimation
- Computational motion planning

Preliminary proposals for potential final project ideas will be due in week 5. A presentation of the complete project proposal for the second quarter will take place during the final week of classes. Weekly plans for development and testing must be prepared, which also summarize progress to date. Material from these reports can be re-used in graded presentations and reports.

Grading structure:

- Lab reports (4) = 40%
- Project proposal (written) = 25%
- Proposal presentation (oral) = 25%
- In class participation = 10%

EE 183DB

Lectures: N/A

Laboratories (4 hours per week): These are entirely devoted to further refinement of the project. Weekly project plans are required. A midterm presentation is made in week 6 and a final presentation and report during exam week.

Grading structure:

- Weekly progress reports (oral) = 10%
- Midterm presentation (oral) = 20%
- Final paper (written) = 30%
- Final presentation (oral) = 30%
- Final demonstration = 10%

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	Tuesday	**Thursday**
Week 1	**Lecture 1** About this course; Introduction to robotics **PSet 0 out**	**Lecture 2** Robot descriptions and state **Lab 1 out**
Week 2	**Lecture 3** Forward and inverse kinematics **PSet 0 due**	**Lecture 4** Static forces and dynamics
Week 3	**Lecture 5** Inverse kinematics, effectors **Lab 1 due, Lab 2 out**	**Lecture 6** Transducers and actuators
Week 4	**Lecture 7** Sensors and state estimation	**Lecture 8** Sensors and state estimation **Lab 2 due**
Week 5	**Lecture 9** Controllers	**Lecture 10** Motion planning **Preliminary proposals due; Lab 3 out**
Week 6	**Lecture 11** Mechanics and materials	**Lecture 12** High level behaviors
Week 7	**Lecture 13** Machine learning **Lab 3 due, Lab 4 out**	**Lecture 14** Rapid design and prototyping
Week 8	**Lecture 15** Systems engineering	**Lecture 16** Multi-robot systems and modular robots **Lab 4 due**
Week 9	**Lecture 17** Underactuated and soft robotics	**Lecture 18** Human-robot interaction
Week 10	**Lecture 19** Project proposal presentations	**Lecture 20** Project proposal presentations