SYLLABUS
INTRODUCTION TO ROBOTICS- SPRING 2018

Instructor:	Youngshik Kim, N7-407, youngshik@hanbat.ac.kr, 821-1163.
Office Hours:	After class, or by appointment.
Lecture Time:	TBA
Lecture Location:	N7-TBA

Course Description and Objectives: This course provides an introduction to the robotics. The main focus will be on kinematics of a manipulator robot, which will cover robot's forward and inverse kinematics. More detailed topics will include homogeneous transformation matrices, D-H parameters, Jacobian, trajectory planning, a controller, robot dynamics. Students will learn how to plan the robot trajectory and make it to move as directed by a user.

Prerequisites: Upper divisions, Linea Algebra

Text: Introduction to Robotics (2nd Ed.), Saeed B. Niku, John Wiley & Sons, 2010

Introduction to Robotics (3rd Ed.), John J. Craig, Prentice Hall(Optional)
Control System Engineering, 5th Ed., Norman S. Nise, Wiley, 2008(Optional)

Class Website: http://cyber.hanbat.ac.kr or
http://robot.hanbat.ac.kr -> Teaching -> Introduction to Robotics
visit the site for class handouts and additional information

Quiz/homework Policies:

1. Quizzes may be given out infrequently at the beginning of class (~15 minutes). These will be based entirely on the reading material covered in previous classes.
2. No cheating in quizzes (no cheating papers, no text books, no talking, no lecture notes)
3. Grading: each homework problem will be evaluated on a 3-point scale: 3 = good effort, results, and technique; 2 = modest effort with some incorrect technique or results; 1 = poor effort or technique; and 0 = no attempt.
4. Homework must be submitted in class on the date due.
5. Late homework will be marked down 10% per business day unless prior arrangements exist.
6. Discussion of homework and teamwork is encouraged, but each student must complete each assignment individually. Figures and computer programs CANNOT be shared.
7. Homework may be discussed in class, but it is the students' responsibility to compare their results to homework solutions to resolve errors in their work.

Exam Policies:

1. Examinations must be taken at the scheduled time unless prior arrangements are made at least two weeks before the exam.
2. Any students cheating on an exam will receive a failing grade for the class.
3. No smartphone or devices except for a calculator (계산기 외 스마트폰 등 기기 금지)

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Grading Polices:

1. No negotiation for grades. (학점 올려달라고 연락하거나 찾아오지 말 것, 점수 깎일 수 있음)
2. Student presence will be checked each class. Exemption will be applied according to University Policies (Article 99, 학사운영규정에 따라 출석 인정): 수업 1/4 (4회)이상 결석 시 F.

Grade Weightings: Midterm Exam: 30%
Final Exam: 30
Term Project: 30%
Class Presence/Attitude/Participation: 10%

SCHEDULE (subject to change)

Week	**Topics**	
1	Introduction	개요
2	Kinematics of robots: Matrix Representation	로봇운동학 I: 행렬 표현
3	Kinematics of robots: Homogeneous Transformation	로봇운동학 II:
4	Kinematics of robots: Forward and Inverse Kinematics, DH parameters	로봇운동학 III:
5	Kinematics of robots: Inverse kinematic solution	로봇운동학 IV
6	Midterm Exam	중간고사
7	Project Design Presentation; Motion and velocities: Jacobian	프로젝트 발표; 모션과 속도
8	Dynamics: Lagrangian	동역학
9	Trajectory planning I	경로계획 I
10	Project presentation; Trajectory planning II	프로젝트 발표; 경로계획 II
11	Motion Control: Basics	모션제어 I
12	Motion Control: Controller	모션제어 II
13	Sensors and Actuators	센서와 구동기
14	Term project presentation	프로젝트 최종발표
15	Final Exam	기말고사

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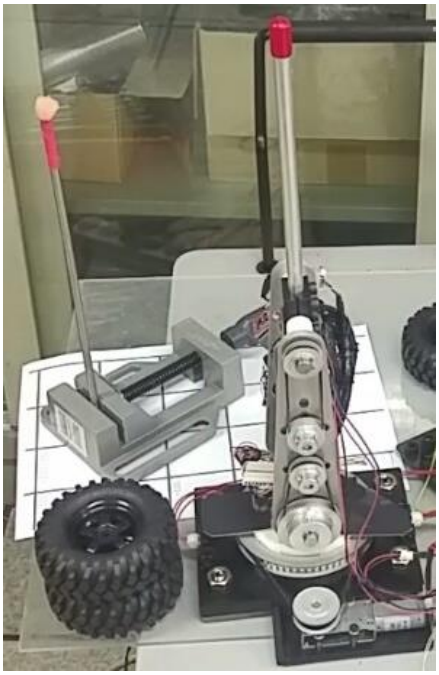
Term Project

Description:

In this project, you are asked to move the robot end effector from a given initial posture (position and orientation) to a specific posture and return it back to the initial posture. Thus, you should understand homogeneous transformation and trajectory planning, which will be covered in the class. You should also understand trajectory tracking control techniques for DC motors and robot dynamics. Each team will use the manipulator robot in the Control and Robotics (ICRS), which will be available by appointment. You will also have an opportunity to demonstrate your achievements and/or experimental results in class. You should submit the final report at the end of this semester. If the robot or other devices used in the class are damaged by students, a student team is required to replace them with new identical products or parts at their expenses. You are expected to complete the following 5 tasks successfully in this project.

Task #1: Find D-H parameters for robots and workspace.
Task #2: Find robot kinematic model.
Task #3: Find inverse kinematics of the robot
Task #4: Plan the robot trajectory using initial and final postures
Task #5: Implement the trajectory planning into the real robot and verify it.



한글요약:

매니퓰레이터 로봇의 경로제어 및 제어 프로젝트임. 매니퓰레이터 로봇 끝단을 정해진 초기 자세(위치와 방향)로부터 새로운 원하는 자세로 이동시킨 후 다시 초기 자세로 위치시켜야 함. 이 과제를 수행하기 위해서는 수업시간에 배운 로봇 운동학과 경로계획 지식을 필요로 함. 그리고 모터제어 및 동역학 지식을 활용할 필요가 있음. 제어로봇실험실의 매니퓰레이터 로봇을 미리 약속을 하여 활용 할 것임. 수업시간에 프로젝트 수행 관련 진행 사항 및 결과물을 발표 및 구동 시현을 할 예정임. 그리고 기말고사 전까지 보고서와 발표 자료를 제출해야 함. 과제 수행 중 실험장비 및 로봇에 손상을 입혔을 경우는 해당 팀이 동일한 제품/부품으로 교체 또는 변상하는 것을 원칙으로 함. 본 프로젝트를 위해서는 다음의 5가지 작업을 성공적으로 수행하여야 함.

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