Assumption University
Faculty of Engineering
MCE 4101: Robotics Engineering

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Evaluation:	Class Works	10 %	(9.00-9.20)
	Assignment	10 %	(No late)
	2 Quizzes (5+5)	10 %	
	Midterm Examination	25 %	
	Final Examination	45 %	
	Total	100%	

Rationale: The objective of this course is to introduce the students various interesting robotic systems, capability to describe the position and orientation of the rigid bodies with common representations, Jacobian matrix for determining the velocity of the serial manipulator, method in generating the trajectory command that satisfies a set of constrained via point, and serial manipulator dynamics and some characteristics

Catalogue Description: Introduction to Robotic system, Spatial descriptions and transformation, Forward and Inverse kinematics, Jacobian, Trajectory generation, and Introduction to robot dynamics.

Course Outline:

I. Introduction to Robotic system
II. Spatial descriptions and transformation
    1. Representing position, representing rotation.
    2. Rotational transformation, composition of rotations.
    3. Parameterization of rotation.
    4. Homogeneous transformation.
III. Forward kinematics
    1. The modified Denavit-Hartenberg convention.
IV. Inverse kinematic
    1. Geometric approach.
    2. Algebraic approach.
V. Jacobian
    1. Angular velocity, linear velocity.
    2. Derivation of the Jacobian, analytical Jacobian.
    3. Principle of virtual work.
    4. Singularities, manipulability.
VI. Trajectory generation
    1. Trajectory for point to point motion.
    2. Trajectory for paths specified by via point.
    3. Joint-space scheme vs. Cartesian-space scheme.
VII. Introduction to robot dynamics
    1. The Lagrange formulation.
    2. The Newton-Euler formulation.
    3. Properties of robot dynamic equation.

Textbook & Materials
Mark W. Spong, Robot Modeling and Control, John Wiley & Sons Ltd, 2006.
Facebook Group: AU Robotics MCE4101

References
John J. Craig, Introduction to Robotics, Mechanics and Control, 3rd edition, Pearson Education, 2005.
Philip J. Mckerrow, Introduction to Robotics, Addison-Wesley Publishing Company, 1993.