Course Title	**MECH 5390 Special Topics-Robotics** **Fall 2018**
INSTRUCTOR:	Angel Flores-Abad, Office: Engineering Building, Room E331, Email: afloresabad@utep.edu
ASSISTANT:	TBD
OFFICE HOURS:	By appointment at E331
LECTURE	TR 10:30-11:50 AM. UGL 210.
LABS	E102 B
DESIRED BACKGROUND	Dynamics, lineal algebra, ODEs and Matlab programing.
COURSE DESCRIPTION :	The course educates students in kinematics, dynamics and control of robotic systems, with emphasis in industrial robotic arms.
COURSE OBJECTIVES:	• Students will use mathematical tools and physical laws to derive and analyze the kinematics and dynamics of robotic systems. • Students will apply the concepts of control system for control design and implementation in robotic systems. • Students will use computer tools to validate and analyze robotic systems. • Students will conduct lab experiments to obtain a better understanding of robotic systems.
TOPICS COVERED	a) Spatial Descriptions (position and orientation) b) Spatial Transformations c) Robot kinematics d) Inverse Robot Kinematics e) Robot Dynamics f) Robot Control g) Trajectory Generation h) Velocity relationships
TEXTBOOKS:	[1] Craig, John J. *Introduction to robotics: mechanics and control*. Vol. 3. Upper Saddle River, NJ, USA: Pearson/Prentice Hall, 2005. Topics a to f. [2] Corke, Peter. *Robotics, Vision and Control: Fundamental Algorithms In MATLAB®* Springer, 2017. Topics a) to d), and g) to h) [3] Kelly, Rafael, Victor Santibáñez Davila, and Julio Antonio Loría Perez. *Control of robot manipulators in joint space*. Springer Science & Business Media, 2006. (topics e & f) [4] Spong, Mark W., Seth Hutchinson, and Mathukumalli Vidyasagar. *Robot modeling and control.* Vol. 3. New York: Wiley, 2006. All topics.
SOFTWARE:	-Matlab. -Mathematica. Refer to ETC for specific instructions on installation. -Download the Robotics simulator from http://petercorke.com/wordpress/toolboxes/robotics-toolbox
GRADING (Dynamic)	i) Labs 300 j) Homework, quizzes, in-class activities etc. 300 k) Exams (two) 300 (150 each) l) Project (simulation and/or experimental): 100 **Total points 1000** A $\geq$ 900, B $\geq$ 800 but <900, C $\geq$ 700 but <800, D $\geq$ 600 but <700 and F <60
Exam 1:	Oct 16
Exam 2:	Dec 6
MATERIAL FOR CLASS	Laptop

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Policies:	• Read the supplementary documents available in Black Board: Addendum to syllabi and rules for exams and quizzes. • The UTEP catalog allows Exam Absence to be excused ONLY for University-Recognized Activities and very specific other situations. Medical absence is NOT allowed in the UTEP catalog. For consistency with the catalog, students will NOT be excused from exams due to illness. Correction period: students will have one week after the assignments, quizzes, exams, etc., are returned with grades to ask for any revision on the grade, after that week, no changes can be done in the grades. • Correction period: students will have one week after the assignments, quizzes, exams, etc., are returned with grades to ask for any revision on the grade, after that one-week, no changes will be done in the grades. • A zero on blackboard as grade means you obtained a zero or you did not submit the assignment. It does not mean the assignment has not been graded.
The above schedule, policies, and assignments in this course are subject to change in the event of contingency or by mutual agreement between the instructor and the students.	

TENTATIVE CLASS SCHEDULE

Week	Dates	Topic(s)	Activity
1	08/28 – 08/30	Course Introduction Spatial Descriptions (Position and Orientation)	- -
2	09/04 – 09/06	Spatial Transformations Spatial Transformation	- Quiz 1 (Transformations)
3	09/11 - 09/13	Robot Forward Kinematics Lab 1: Robot Forward Kinematics	- Lab 1
4	09/18 - 09/20	Matlab assignment (s)	Quiz 2 (FK) -
5	09/25 – 09/27	Robot Inverse Kinematics Robot Inverse Kinematics	- -
6	10/02 – 10/04	Robot Inverse Kinematics Robot Dynamics	- Quiz 3 (IK)
7	10/09 – 10/11	Lab 2: Robot Inverse Kinematics Robot Dynamics	Lab 2 -
8	10/16 – 10/18	**Exam 1 (Topics a, b, c & d)** Robot Dynamics	**Exam 1**
9	10/23 – 10/25	Lab 3: Robot Dynamics Control Theory Review	Lab 3 Quiz 4 (Dynamics)
10	10/30 - 11/01	Control Theory Review Robot Control	- Quiz 5 (Control)
11	11/06 - 11/08	Robot Control Lab 4: Robot Control	- Lab 4
12	11/13 - 11/15	Trajectory Generation Trajectory Generation	Quiz 6 (Robot Control) -
13	11/20 – 11/22	Lab 5: Trajectory Generation - Thanks Giving Break	Lab 5 -
14	11/27 – 11/29	Jacobians: Velocities and statics forces Jacobians: Velocities and statics forces	Quiz 7 (Trajectory Gen.) -
15	12/04 – 12/06	Lab 6: Jacobians **Exam 2 (Topics e, f, g & h)**	Lab 6 **Exam 2**
	12/13	Final Project Submission	Final Project