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Department of Mechanical Engineering	
Robotics (67682)	
Total Credits	**3**
major elective	
Prerequisites	P1 : Control Systems I (67471) OR Automatic Control (67325) P2 : Theory of Machines (67310)

Course Contents

Robot fundamentals. Robot kinematics: position analysis. Differential motions and velocities (Jacobian and inverse Jacobian). Dynamic analysis and forces. Trajectory planning. Actuators and Sensors of robotic systems.

	Intended Learning Outcomes (ILO's)	Student Outcomes (SO's)	Contribution
1	Recognize the different types of spatial rotations about fixed and moving axes and obtain the rotation/translation matrix in a systematic way	A	20 %
2	Solve manipulator direct and inverse kinematics	E	30 %
3	Solve velocity and static and dynamic force relations basing on the Jacobian matrix	E	25 %
4	Design the trajectory of the end effector of the manipulator to accomplish general conditions	C	10 %
5	Work in a team, perform a complete project and present the work in proper ways including Matlab simulation, writing technical reports and making oral presentations	D	15 %

Textbook and/ or Refrences

Introduction to Robotics, mechanics and control. J.J. Craig. 3rd Ed. 2005. Foundations of Robotics. T. Yoshikawa. 1990.

Assessment Criteria	Percent (%)
First Exam	20 %
Second Exam	20 %
Quizzes	5 %
Projects	15 %
Final Exam	40 %

Course Plan

Week	Topic
1	Introduction
2 &3	Spatial description and transformations
4 &5 &6	Manipulator kinematics
7	First Exam
7 &8 &9	Inverse manipulator kinematics
10 &11 &12	Jacobian, velocities and static forces
13	Second Exam
13 &14	Manipulator dynamics
15 &16	Trajectory generation
16	Final Exam