

Trends in Teaching Robotics to UG/PG Students

[Teaching Robotics: 6 years]
[Total teaching experience: 17 years]

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Course: Robotics Engineering (UG)/Robotics (PG)

SN	Lecture (3 hrs. module)	Lab. (2 hrs. module)
1	Applications; Types (Mobile, Parallel); Serial: Cartesian, Cylindrical, etc.	Demos of ER9 robot; Virtual Robotics Lab. in ADAMS
2	Sensors and actuators used in Robots	DH parameters of a real robot
3	Pose, DH Parameters, Homogenous Trans.	Forward kinematics in MATLAB
4	Forward and Inverse Kinematics	Inverse kinematics derivations
5	Jacobian: Velocity transformation	Programming in MATLAB
6	Statics: Use of Jacobian	Find Jacobian , singularity
7	Dynamics: Newton-Euler Recursive Algorithm	Class Project 1 Presentation
8	Euler-Lagrange Equations of motion/DeNOC	Control simulation (MATLAB)
9	Kinematic design: Singularity, Dexterity, etc.	DC motor control set-up
10	Mechanical design of robot links	Programming of ER9 robot
11	Control: Definition, closed-loop algorithm	Verify using RoboAnalyzer
12	Motion planning: Polynomial, Spline, etc	Dynamics of 3R robot
13	Parallel Robots: Inverse kinematics	Project 2 presentation
14	Forward Kinematics of parallel robots	Buffer class

Books/Software/Other Aids

- **Text Book**
 - Saha, S.K., Introduction to Robotics, Tata McGraw-Hill, New Delhi, 2008
- **Other Books**
 - Ghosal, A., Robotics, Oxford, New Delhi, 2006
 - Craig, J.J., Introduction to Robotics: Mechanics and Control, Pearson Education, 2009
- **Software**
 - RoboAnalyzer, MATLAB
- **Other Aids**
 - Class Projects: 1) Dynamics Model of RP manipulator;
 - 2) Modeling of an AGV
 - Robocon competitions

In Next 10 Years

- Use more of RoboAnalyzer/MATLAB software to understand the concepts.
- Do more assignments
- Use software/build hardware for class projects
- Emphasize on mathematical formulations and design aspects.
- Consider credits in the Robocon type of activities

Thank you for your attention!
Any question/comment?