Faculty of Applied Sciences

MECA2732   Introduction to robotics.

[30h+15h exercises] 4 credits

This course is taught in the 2nd semester

Teacher(s):	Paul Fisette, Jean-Claude Samin
Language:	French
Level:	Second cycle

Aims

- Describe the various technical features of industrial robotics used for production.
- Analyse the various components (mechanical structures, actuators, transmissions, sensors, ...) involved in industrial robots.
- Show the potential - and limitations - of a robot manipulators in practical use.

Main themes

Robotics and automation changed production processes during the closing years of the last century. This course thus aims at describing the main features of robots :
- technico-economical justification of robotization
- classification of robots
- robot components and devices : actuators, transmissions, sensors, end effectors and control
- robot programming and task planning
- kinematics of robot manipulators and path generation
- industrial computer vision.

Content and teaching methods

1. Introduction
- History and technico-econominal motivations
- Definition, classification and performances.
2. Mechanical components : actuators, transmissions, reducers.
3. Robot programming and control schemes (computed torque method).
4. End effectors : desing of tools and grippers.
5. Geometrical and kinematic models : homogeneous transformations, Denavit - Hartenberg parameters, Jacobian matrix, singularities.
6; Trajectory planning methods.
7. Review of external sensors, includig vision systems (hardware and software aspects).
8. Task planning : use of artificial intelligence.
The lectures are illustrated by two laboratories. The first consists in teaching an industrial robot (PUMA). The second one aims at the off lilne programming (by computer simulation) of a robotized assembly cell.

Other information (prerequisite, evaluation (assessment methods), course materials recommended readings, ...)

Prequisite none.
Evaluation : oral examination.
Support : lecture notes and copies of the slides used during the lectures.
Recommended readings :
- B. Gorla et M. Renaud, Modèles des Robots Manipulateurs : Application à leur Commande, Cepadues éditions, 1984.
- E. Dombre et W. Khalil, Modélisation, Identification et Commande des Robots, Traité des Nouvelles Technologies : Série Robotique, Hermes, deuxième édition, 1999.
- K.S. Fu, R.C. Gonzalez and C.S.G. Lee : robotics : Control, Sensing, Vision and Intelligence, McGraw-Hill, 1987.

Other credits in programs

ELEC23   Troisième année du programme conduisant au grade   (4 credits)
                    d'ingénieur civil électricien