

ELG 5161 **ROBOTICS: CONTROL, SENSING AND INTELLIGENCE**

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Schedule: LEC 1 => Monday 11:30 - 13:00, CBY D103
 LEC 2 => Wednesday 11:30 - 13:00, CBY D103

Marking system:

Assignments	10%
Project report ...	50%
Final exam.	40%

Course description:

Introduction:

Robotics as the intelligent connection of the perception to action. Robotic technologies.

Review of the Classic Sensor- Based Robot Control Techniques:

Robot kinematics and dynamics. Robot sensors: proprioceptors and exteroceptors. Controlling robot manipulators and mobile robots.

Non-Visual Sensors:

Position sensors. Absolute position recovery using pseudo-random encoding. Range sensing. Proximity sensing. Force and torque sensors. Tactile sensors. Haptic perception. Sensor standards. Plug-and-play sensors.

Robot Vision:

Image acquisition. Preprocessing. Segmentation. 3D vision. Structured light.

World Perception and Modelling:

Object recognition. Linguistic pattern recognition. Multisensor data fusion.

Soft Computing Techniques for Robot Control:

Fuzzy logic control. Behavior-based neuro-fuzzy controller for mobile robot navigation.

Robot Intelligence:

Robot programming languages. Task planning. Intelligent autonomous systems.

Applications:

Human-robot interaction. Intelligent robotic sensor agents for environment monitoring.

References:

- K.S. Fu, R.C. Gonzalez, and C.S.G. Lee, *Robotics: Control, Sensing, Vision, and Intelligence*, McGraw-Hill, 1987
- P.J. McKerrow, *Introduction to Robotics*, Addison-Wesley, 1991
- H.R. Everett, *Sensors for Mobile Robots: Theory and Application*, A.K. Peters, Ltd, 1995