CPE 416 – Autonomous Mobile Robots

1. CPE 416 – Autonomous Mobile Robots

2. credit units 4 contact hours 6

3. Course Coordinator: John Seng

4. Textbook (or other required material): None

5. a. Course Description:
Theory and application of concepts relevant to autonomous mobile robots. Sensor and actuator interfacing, programming mobile robots, mobile robot configurations, software architectures and algorithms. 3 lectures, 1 laboratory.

b. Prerequisite: CPE/EE 329 or CPE/EE 336 or both CPE 315 and CPE/CSC 357.

c. Required/Elective/Selective Elective for CPE, CSC, EE, SE

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6. a. Course Learning Objectives
The student will be able to:

- Explain the effect of the individual terms of a PID control system
- Write programs to control a small robotic system
- Describe the process and steps of a robot localization algorithm
- Explain the structure of a neural network

b. Level at which Student Outcomes are addressed
(“B” = Basic level, “I” = Intermediate level, “A” = Advanced level)

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7. Major Topics Covered: (number of lecture hours per)
- PCB assembly (robot controller board) (3 hours)
- Interfacing Sensors (2 hours)
  - analog sensors
  - digital switch sensors
- Using operational amplifiers (2 hours)
  - comparator circuits
  - buffer circuits
- Shaft encoding and quadrature encoding (2 hours)
- PID control (2 hours)
- Basic robot localization (2 hours)
- Odometry model for differential drive robots (1 hour)
- Basic vision systems (2 hours)
- Robot software architectures (1 hour)
- Neural networks (3 hours)
- Motors and control (2 hours)
- Robot Wheel Configurations (2 hours)
- Final Project (6 hours)