CSCE 574: Robotics

1. Course number and name: CSCE 574: Robotics

2. Credit: 3-hrs; Contact: 3 lecture periods of 50 minutes or 2 periods of 75 minutes per week

3. Instructor: Jason O'Kane

4. Textbook: There are two recommended textbooks for the course:
   a.Gregory Dudek and Michael Jenkin, *Computational Principles of Mobile Robotics*, Second Edition. Cambridge University Press, New York, NY, 2010.
   b.Howie Choset, Kevin M. Lynch, Seth Hutchinson, George Kantor, Wolfram Burgard, Lydia E. Kavraki, and Sebastian Thrun, *Principles of Robot Motion: Theory, Algorithms and Implementations*, MIT Press, Cambridge MA, 2005.

5. Specific course information
   a.Catalog description: Design and application of robotic systems; emphasis on mobile robots and intelligent machines.

   b.Prerequisites: CSCE 211, 212, 240

   c.Elective Course

6. Specific goals for the course
   a.Specific outcomes of instruction are that students will be able to:
      1. Describe the components of robot systems.
      2. Use a robot's work space and configuration space for representation, reasoning, and planning.
      3. Implement and use algorithms for controlling mobile robots.
   b.As an elective cannot be counted upon in enabling any student outcome.

7. Topics covered and approximate weight

Topic	Approximate Weight
Introduction	1 hour
Fundamental problem types	1 hour
Robot hardware	2 hours
Locomotion	4 hours
Control Architectures	2 hours
Bug Algorithms	2 hours
Potential functions	2 hours
High-level planning	2 hours
Configuration spaces	2 hours
Roadmaps	3 hours
Cell decompositions	3 hours
Player/Stage software	1 hour

Sampling-based motion planning	2 hours
Localization	2 hours
SLAM	2 hours
Multiple robots	1 hour
Vision	1 hour
Tests	2 hours

Computer Engineering

Relation of Course Outcomes to EAC Student Outcomes*

Course Outcomes (CE)	Student Outcomes											
	(a) apply knowledge of mathematics, science, and engineering	(b) design and conduct experiments, … interpret data	(c) design a system, component, or process to meet desired needs …	(d) function on multidisciplinary teams	(e) identify, formulate, and solve engineering problems	(f) an understanding of professional and ethical responsibility	(g) communicate effectively	(h) the broad education to understand the impact of engineering solutions …	(i) a recognition of the need for, and an ability to engage in life-long learning	(j) a knowledge of contemporary issues	(k) use the techniques, skills, and modern engineering tools ….	(CE) demonstrate knowledge of discrete mathematics [CE]
Criteria	a	b	c	d	e	f	g	h	i	j	k	CE
1. Describe the components of robot systems.												
2. Use a robot's work space and configuration space for representation, reasoning, and planning.												
3. Implement and use algorithms for controlling mobile robots.												
4.												

5.											

* 3 = major contributor, 2 = moderate contributor, 1 = minor contributor; blank if not related

      a.

Computer Science & Computer Information Systems

Relation of Course Outcomes to CAC Student Outcomes*

Course Outcomes (CS & CIS)	Student Outcomes											
	All									CS		CIS
	(a) apply knowledge of computing and mathematics appropriate to the discipline	(b) analyze a problem, and identify and define the computing requirements …	c) design, implement, and evaluate a computer-based system, …	(d) function effectively on teams to accomplish a common goal	(e) An understanding of professional, ethical, legal, … responsibilities	(f) communicate effectively with a range of audiences	(g) analyze the local and global impact of computing on … society	(h) Recognition of the need for … continuing professional development	(i) current techniques, skills, and tools necessary for computing practice	(j) apply mathematical foundations, algorithmic principles, and CS theory …	(k) apply design and development principles	(j) An understand processes that support the information systems environment.
Criteria	a	b	c	d	e	f	g	h	i	j	k	j
1. Describe the components of robot systems.												
2. Use a robot's work space and configuration space for representation, reasoning, and planning.												
3. Implement and use algorithms for controlling mobile robots.												
4.												
5.												

* 3 = major contributor, 2 = moderate contributor, 1 = minor contributor; blank if not related