

# ECE 5463: Introduction to Real Time Robotics Systems

## Course Description

Components of a robot system, types, electronic system components, and analog-digital conversion; robot kinematics and dynamics; error analysis; autonomous mobile robots; hardware and software.

**Prior Course Number:** 763

**Transcript Abbreviation:** Real Time Robotics

**Grading Plan:** Letter Grade

**Course Deliveries:** Classroom

**Course Levels:** Undergrad, Graduate

**Student Ranks:** Junior, Senior, Masters, Doctoral

**Course Offerings:** Autumn

**Flex Scheduled Course:** Never

**Course Frequency:** Even Years

**Course Length:** 14 Week

**Credits:** 3.0

**Repeatable:** No

**Time Distribution:** 3.0 hr Lec

**Expected out-of-class hours per week:** 6.0

**Graded Component:** Lecture

**Credit by Examination:** No

**Admission Condition:** No

**Off Campus:** Never

**Campus Locations:** Columbus

**Prerequisites and Co-requisites:** Prereq: 2560 (265), 3020 (323), and 3050 or 352, or Grad standing in Engineering.

**Exclusions:** Not open to students with credit for 763.

**Cross-Listings:**

**Course Rationale:** Existing course.

**The course is required for this unit's degrees, majors, and/or minors:** No

**The course is a GEC:** No

**The course is an elective (for this or other units) or is a service course for other units:** Yes

**Subject/CIP Code:** 14.1001

**Subsidy Level:** Doctoral Course

## Programs

Abbreviation	Description
CpE	Computer Engineering
EE	Electrical Engineering

## General Information

In terms of topics, the prerequisites include Laplace transform and its use in linear system analysis, C programming, microprocessor systems, basic electronics, state equations, basic kinematics, basic control system principles. Knowledge of linear algebra is a necessity.

## Course Goals

Provide an introduction to real-time robotics systems
Learn to analyze and design robot manipulators and mobile robots. This includes study in hardware components -- the sensors, actuators, and support electronics -- as well as the kinematics, dynamics, and servos for real-time operation
Work in teams to develop a graphical simulation of a robotic system using a high-level language and graphics package

## Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Overview of robotics systems and their programming	4.0							
Homogeneous transformations	3.0							
Direct kinematics	3.0							
Inverse kinematics	2.0							
Dynamics	3.0							
Actuators and their modeling and drive	5.0							
Simulation and control of joint actuator systems	5.0							
Position and velocity sensing	4.0							
Mobile robots kinematics and dynamics	3.0							
Mobile robot navigation	5.0							
Mapping and localization	4.0							

## Representative Assignments

Homework problems are assigned according to the progress of the lectures. Three projects related to the course topics are assigned during the semester.
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## Grades

Aspect	Percent
Homework assignments	10%
Project assignments	10%
Two midterms	40%
Final	40%

## Representative Textbooks and Other Course Materials

Title	Author
<i>Modern Robotics: Mechanics, Planning, and Control</i>	Kevin M. Lynch and Frank C. Park

## ABET-EAC Criterion 3 Outcomes

Course Contribution	College Outcome
***	a An ability to apply knowledge of mathematics, science, and engineering.
*	b An ability to design and conduct experiments, as well as to analyze and interpret data.
*	c An ability to design a system, component, or process to meet desired needs.
*	d An ability to function on multi-disciplinary teams.
*	e An ability to identify, formulate, and solve engineering problems.

Course Contribution		College Outcome
*	f	An understanding of professional and ethical responsibility.
	g	An ability to communicate effectively.
*	h	The broad education necessary to understand the impact of engineering solutions in a global and societal context.
	i	A recognition of the need for, and an ability to engage in life-long learning.
	j	A knowledge of contemporary issues.
**	k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

### Additional Notes or Comments

updated prereqs, exclusions, and goals to match university format

Changed semicolon to comma in prereq per registrat request. 2/24/12

Change prereq 551 to 352 3/27/13

Edited text info, 5/10/17, CED

Changed text to Lynch and Park BLA 10/10/17

**Prepared by:** Betty Lise Anderson