

Faculty

Carlotta Berry, Asst. Prof. of Electrical and Computer Engineering. PhD Vanderbilt University (2003, Electrical and Computer Engineering). Dr Berry's research focuses on human-robot interfaces for mobile robots. She teaches *Introduction to Mobile Robotics*, a laboratory-based special topics course she created that uses a Traxster robot to introduce junior and senior-level students to the field of mobile robotics including theory, behaviors and control.

Matthew Boutell, Asst. Prof. of Computer Science and Software Engineering. Ph.D. University of Rochester (2005, Computer Science). Dr. Boutell teaches Robotics programming, having taught programming for 8 years. He is also interested in robot vision, having worked for four years at Eastman Kodak Company on understanding the contents of consumer photographs.

Steven Chenoweth, Assoc. Prof. of Computer Science and Software Engineering. Ph.D. Wright State University (1990, Computer Science and Engineering). Dr. Chenoweth's research focus is Artificial Intelligence (heuristic search), one of the core robotics-related computing areas. His background includes a career in Software Engineering at NCR Corporation and Bell Laboratories. He has taught graduate and undergraduate courses at all levels from Introduction to Software Development to senior design projects including *Teamwork and Robotics*.

David Fisher, Asst. Prof. of Mechanical Engineering. PhD Stanford University (2005, Mechanical Engineering). While at Stanford, Dr. Fisher worked in the Biomechanics Division and focused on markerless motion capture. While at Rose-Hulman, Dr. Fisher spends most of his time teaching Mechatronics, a course focusing on using a microcontroller to control physical input and output devices.

Robotics Clubs

Rose-Hulman has an active student-run robotics club (<http://rhitrobotics.org>), which consists of student volunteers from multiple disciplines. The club competed in the Intelligent Ground Vehicle competitions in June 2008 and 2009. This club has been in existence for over ten years and in 1998 placed third in an international aerial robotics competition where students worked with faculty to design and control an autonomous helicopter.

The club has also made presentations and demonstrations at the Botball Midwest Regional Tournament. The Botball educational robotics program also has a middle school chapter advised by Dr. David Mutchler.

Industry Partners

Alcoa
Beckman Coulter
Precise Path Robotics
Silicis Technologies

Photo credits

Cover: ECE497 final project, Spring 2007, courtesy of Clark Merkel.

Roomba: Robot used in CSSE120R, courtesy of iRobot (<http://www.irobot.com>).

SodaBot: courtesy of Chris Quick.

For more information, contact us!

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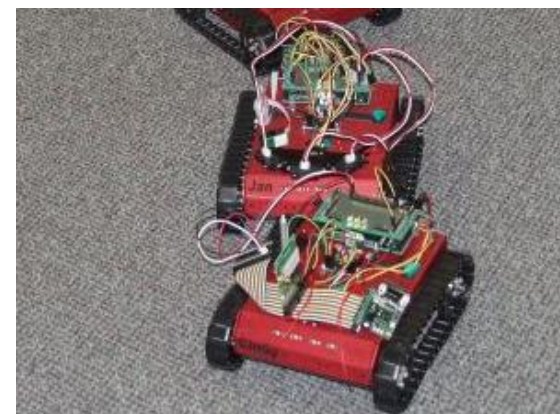
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Robotics Certificate Program

<http://robotics.rose-hulman.edu/>



ROSE-HULMAN
INSTITUTE OF TECHNOLOGY

Why robotics?

We all know robots are cool. Robots already make our lives easier, and will continue to do so. Robots such as the Roomba © vacuum cleaner work in millions of homes. Robots work in the automotive industry assembling cars on the line. In the pharmaceutical industry, they automate the tedious work of filling thousands of vials for experimental research.

How do I work on robots at Rose-Hulman?

In the workforce, robotics engineers specialize in an area like kinematics, controls, or programming. They need to understand the whole system at a high-level to communicate with others, but tend to contribute primarily in a concentration. We have developed the curriculum at Rose-Hulman with this in mind. There is no Robotics major; rather students major in the area that most interests them: Mechanical Engineering, Electrical Engineering, Computer Engineering, Computer Science, or Software Engineering. They then earn the multidisciplinary Robotics Certificate by taking courses shown on the next page. They cap their experience by working on a multidisciplinary Robotics project their senior year with students pursuing the other majors.

How can I start right away at Rose?

Students with little or no programming experience should take *Robotics Programming*. You can also join the Robotics Club (back page). The club welcomes students with robotics experience, like FIRST and Botball.



What is a certificate?

A certificate program is essentially a minor – for instance, it requires the same number of courses. However, it is multidisciplinary, requiring students to take courses in multiple departments.

Robotics Certificate Requirements

As a student in the robotics certificate program, your courses may include:

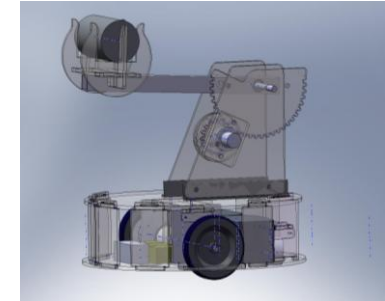
CSSE 120R: Intro to Robotics Programming
CSSE220: Object-oriented Software Dev.
CSSE 230: Data Structures and Algorithms
CSSE 413: Artificial Intelligence
CSSE 461: Computer Vision
CSSE 463: Image Recognition
CSSE 490: Swarm Intelligence
CSSE 490: Teamwork and Robotics
ES 203: Electrical Systems
ECE130: Introduction to Logic Design
ECE 207: Electrical Engineering
ECE 320: Linear Control Systems
ECE 333: Digital Systems
ECE 414: Wireless Systems
ECE 497: Mobile Robotics
ECE 520: Discrete-time Control Systems
ECE 521: Modern Control Systems
ME 303: Kinematics of Machinery
ME 406: Control Systems
ME 430: Mechatronic Systems
ME 435: Robotics Engineering
ME 506: Advanced Control Systems
ME 518: Advanced Kinematics
OE 295: Optical Systems
EP 408: Microsensors
PH 437: Image Processing
PH 537: Advanced Image Processing

Students choose a track consisting of seven courses. Tracks and prerequisites for various majors can be found on the website.

What past projects have students done?

Some student teams have already completed robotics-related projects:

For their senior project, CSSE and ME students created a SodaBot, a robot to deliver sodas from our web-based soda machine to students and faculty down the hall.



Two ME430 students built “Shadow the Dog”, capable of moving as well as doing several tricks, like sitting and wagging its tail, on command. Shadow’s microcontroller was controlled remotely using IR.



CSSE students created a simulator for the Intellibrain robot that plugs into Ridgesoft’s RoboJDE software for their senior project.

Robotics affords an excellent opportunity for multidisciplinary student teams to work together – while this skill requires work to develop, it is a skill that is increasingly valuable in the workforce.