

Fairleigh Dickinson University

REQUEST FOR PERMANENT COURSE APPROVAL OR COURSE CHANGE

FULL COURSE TITLE: Application of Robotics to Global Issues

Abbreviated Course Title (30 characters maximum) Robotics and Global Issues

Type of Approval Sought:

New Course X Delete from Catalog Change in Existing Course (specify change): Other Please specify:

Faculty Member(s) Initiating the Course or Course Change: Leonard Sheehy

Department(s)/ Academic Unit(s) of Origin Science MA

Student Credit/Semester Hours 3 Prerequisite(s) None

Type of Course (check all that apply in parts 1 & 2):

1 UNDERGRADUATE: 90 100 200 300 400 500 600 700 X 800 900 GRADUATE:

2 Academic Foundations: Education Technology General Education Tier: 1

General Education Mode(s) of Inquiry: Research

Major: Required Elective X Minor: Required Elective

Interdisciplinary Program: Required Elective X

Component Workload Hours: Lecture 5 Lab 10 Studio

APPROVAL RECOMMENDED

Chair, Department Curriculum Committee Date

Chair, Department or Academic Unit Date

Chairperson(s) Consulted, Department(s) or Academic Unit(s) Date Courses that cross departmental/unit lines must be submitted to other chair(s) for consultation before submitting to the dean(s)

Chair, College Curriculum Committee Date

Dean, College of Course Origin Date

Chair, General Education Curriculum Committee (for General Education courses only) Date

Chair, Senate Curriculum and Instruction Committee or Chair, Senate Graduate Studies Committee Date

Provost Date

COURSE NUMBER: _____

Number assigned by Registrar

FACULTY WORKLOAD: _____

Assigned by Provost

NOTIFICATION

Dean, CAS Date

Dean, COE Date

Dean, CPS Date

Dean, GS Date

Library Date

Registrar Date

This course proposal is for the Science MA - Elementary Science Specialist Concentration program at Fairleigh Dickinson University. The website for this program can be found at the following link; <http://view2.fdu.edu/academics/university-college/institute-of-math-and-science/ma-in-science/>.

Application of Robotics to Global Issues will allow students to use a full array of skills as they research current concerns facing our world. Students will first explore topics then use technology to help solve these problems by designing and assembling robots. Robotics skills are in increasing demand with the market growing to \$41.17 billion by 2020 according to a report by Allied Market Research (Robotics Tomorrow, 2014).

Guidelines for Requesting New Course Approval and Course Changes

1. Robotics and global issues.
2. Regions throughout the globe have unique challenges. Students will confront issues that our world faces and configure robotics to help solve them.
3. This is a three-credit course.
4. This course will include face-to-face lectures and demonstrations where students will learn how to assemble and program robots. In the lab section students will work in groups both online and in person to develop their robots. Discussions of how robots can contribute to solving global topics will take place online through go-to-meeting as students collaborate to design their robot.
5. This is a 700-level course.
6. Students will learn how to program a robot. The applications developed will involve students demonstrating knowledge of global events. Students will choose a topic that affects everyone in the world such as global warming, hunger, or disease. They will then create a robot that will be a positive influence on the topic.
7. There are no prerequisites.
8. This course prepares students for a professional career. Students will develop problem solving and technical skills while becoming aware of global issues.
9. By the end of the course students will (a) be able to select and research global issues, (b) communicate the research using effective writing skills reflecting responsible citizenship in a culturally complex world and develop technology addressing these issues. (c) Students will also design and assemble a robot to contribute in a positive manner to the global issue researched previously.

10. Students will be assigned online research assignments where they will define the global issue they have chosen and describe how their application will address the issue (9a). Students will first complete their research individually by submitting a paper on the global topic (9b). They will then participate in online discussions to collaborate on how their project will be developed (9b). Face to face lectures and lab work will include lectures on how to program and operate the robot (9c). Finally, a video will be produced by each group demonstrating their project that will later be presented at an online exhibition (9a,b,c).

11. Course Content (Provide a detailed outline that reflects the scheduling of the course content over the typically 15-week semester including finals week. Attach parenthetically the specific related Student Learning Outcomes listed in Section 9 to each week.)

	Lesson	Information and Orientation	Learning Outcome	Assignments
1	Introduction to Global Robotics Applications	Students will be provided a detailed explanation of course expectations and assignments	9 (a,b,c)	Meet as a group online to discuss selection of a global issue to be researched.
2	Introduction to Robotics	History and current use of robots in society will be presented.	9 (a,b,c)	Each group will provide the global topic to be researched.
3	Build Your Own Robot Sweeper	Students will assemble a robot sweeper. This will provide them skills and knowledge on how to create their own project.	9 (c)	Students will create a robot in class.
4	Traveling Robot	Students will assemble a robot that uses light sensors.	9 (c)	Students will create a line tracking robot in class.
5	Intruder Alarm	Students will assemble a robot that uses a laser to detect motion and sound an	9(b,c)	Assignment 1 due.

		alarm.		Students will create an intruder alarm.
6	Robot Networking and Communication with Wi-Fi	Students will control their robot remotely.	9(c)	Students will install a Wi-Fi sensor.
7	Robot Medical Assistant	Students will learn how create code to control their robot.	9(c)	Students will create a pill dispenser.
8	Data Logger	Students will learn how to install a card reader to the robot.	9(c)	Students will create a patient temperature recording device.
9	Remote-Controlled User Interfaces	Students will learn how to program display information to users.	9(b,c)	Assignment 2 due. Students will create a screen to display the temperature to a patient.
10	Security Robot	Students will install a camera on the robot.	9(c)	Students will create a security robot.
11	Light and Sound	Students will install NeoPixel Ring and Microphone to the robot.	9(c)	Students will build a light and sound system to dance.
12	Android App Controller	Students will learn how to program the robot for Android enabled devices.	9(c)	Students will remotely control their robot by using their phone.

13	Additional Robotics Applications	Students will focus on how to modify their robot to solve global issues.	9(a,b)	Students will review medicine, education, military and industrial applications.
14	Capstone project preparation	Students will apply the skills obtained in the previous lessons to create a capstone project.	9(a,b,c)	Students will work in groups to create a capstone project. Students will participate in a go-to-meeting lesson as a group to prepare for the presentation.
15	Capstone project presentation	Students will apply the skills obtained in the previous lessons to present the capstone project.	9(a,b,c)	Students will present their capstone projects.

12. NA

13. This is an elective course

14.

Assessment 1 - Individual research paper on a global issue your group chose. 25 % of grade

Assessment 2 - Group project - create a power point, website or video describing how your robot will improve the global issue from assessment 1. 25 % of grade

Assessment 3 - Capstone project - create a video demonstrating you robot at work. 25 % of grade

15. Required Text

Prayaga, L., Prayaga, C., Whiteside, A., Ramakrishna, S. (2015). *Robotics - a project-based approach*. Boston: Cengage Learning PTR.

Supporting Bibliography

*Adams, M. & Jose, E. (2012). *Robotic navigation and mapping with radar*. Artech House.

*Becker, A., Onyuksel, C., Bretl, T., McLurkin, J. (2014) Controlling many differential-drive robots with uniform control inputs *The International Journal of Robotics Research* 33 1626-1644.

*Bishop, O., & Ebrary, I. (2007). *The robot builder's cookbook*. Amsterdam: Elsevier

*Borowy, I. (2014). Sustainable health: the need for new developmental models. (2014). *World Health Organization* 85 (699), 7.

Brumson, B. (2012). *New Applications for Mobile Robots*. Industry Insights Robotics Industries Association. Ann Arbor, MI.

*B-Lajoie, M. (2014). In this month's Bulletin. *Bulletin of the World Health Organization*. *World Health Organization* 92 (14), 697.

Hheltmggaard, K. (2014). Ten greatest threats facing the world in 2014. *USA Today*. January 16, 2014.

*Homayoun, R. (2014). Dynamic analysis of fixed geometry tracked robots *International Journal of Robotics & Automation, suppl. Supplement 4* 29.4.

*Ho, C., Tsakonas E, Tran K, Cimon K, Severn M, Mierzwinski-Urban M, Corcos J, Pautler S. (2011). Robot-assisted surgery compared with open surgery and laparoscopic surgery clinical effectiveness and economic analysis. *Canadian agency for drugs and technologies in health*. 137.

Jones, M. (2014). Robotic milers prove a lifeline for some dairy makers *Milwaukee Journal Sentinel*. Retrieved on November 19, 2014 from <http://www.jsonline.com/news/wisconsin/robotic-milkers-prove-a-lifeline-for-some-dairy-farmers-b99278988z1-261391991.html>

*Kannammal, A. & Rani, S. (2014) Authentication and encryption for medical image security system *International Journal of Robotics & Automation, suppl. Supplement 429.4*.

Lim, A. (2014). What Robot Behavior Makes People Feel Uncomfortable? *Spectrum Institute of electrical and electronics Engineers 3* (20), 22.

Makiura, D. (2014). A collection of TED talks (and more) on the topic of global issues. Webcast. TED Talks. Retrieved from <https://www.ted.com/topics/global+issues> on November 25, 2014.

Mataric, M. (1999). Behavior-Based Robotics. *MIT Encyclopedia of Cognitive Sciences*, 74 (2), 47.

Nagy, E. (2014). "These lego robots solve real-world problems." The recommender. Fast company. Retrieved from <http://www.fastcompany.com/3029011/the-recommender/these-lego-robots-solve-real-world-problems> on November 25, 2014.

*Nourbakhsh, I. (2013). *Robot Futures*. MIT Press. Cambridge MA.

Rivers, C. (2004). Advanced technology allows robot to steer around obstacles and call for elevators. University of Maryland Medical Center press release. May 10, 2004.

*Shah, A. (2014). Social, political, economic and environmental issues that affect us all. *Global Issues*. Retrieved on November 25, 2014 from www.globalissues.org.

*Tucker, J. (2014). She would rather perish: piracy and gendered violence in the Mediterranean. (2014) *Journal of Middle East Women's Studies*, 10 (26), 8.

Turner, S. & Hill, G. (2014). Robots in problem-solving and programming. *academia.edu*. Retrieved on November 20, 2014 from http://www.academia.edu/184158/Robots_in_Problem-Solving_and_Programming

Relevant Periodical Sources

Global Journal of Technology & Optimization

Information Technology, Education and Society

International Journal of Robotics & Automation

Issues in Global Education

Journal of global business and technology

Journal of Global Information Management (JGIM)

Journal of Global Information Technology Management (JGITM)

Learning and Leading with Technology: The ISTE Journal of Educational Technology

Practice and Policy
MIT Encyclopedia of Cognitive Sciences
Perspectives on Global Development and Technology
International Journal of Robotics and Automation
The International Journal of Robotics Research
World Health Organization

Relevant Online Materials

Nagy, E. "These lego robots solve real-world problems." The recommender. Fast company. Retrieved from <http://www.fastcompany.com/3029011/the-recommender/these-lego-robots-solve-real-world-problems> on November 25, 2014.

Industrial Robotics Market is Expected to Reach \$41.17 Billion, Globally, by 2020. (2014). Robotics Tomorrow. Retrieved from <http://www.roboticstomorrow.com/article/2014/06/industrial-robotics-market-is-expected-to-reach-4117-billion-globally-by-2020/266/> November 26, 2014.

16.

Go to meeting one year license \$468
 Arduino Uno R3 board
 Magician Chassis kit
 Ardumoto board
 Ultrasonic range sensor model HC-SR04
 9-volt battery
 Jumper wires with connectors
 Solderless breadboard, plug-in type
 Piece of dust cloth
 QRE1113 Analog line sensors
 Robot chassis with Arduino board and Ardumoto motor control shield
 TCS34725 color sensor

Laser diode sensor
Photo resistor sensor
Ultrasonic range sensor
LEDs of different colors
Solderless breadboard and hook wires
Arduino Wi-Fi shield
USB mini cable
Ultrasonic range finder
Wi-Fi network LCD display
Push button
Trimmer potentiometers (2)
Speaker
TMP36 temperature sensor
16 x 2 LCD panel + 10 ohm potentiometer
Stackable SD card reader
SD card
USB mini cable
Computer with internet access
NetBeans with JDK (free software)
RadioShack camera shield
SD card shield with SD card
Computer with SD card reader
NeoPixel ring. A 12-LED ring from Adafruit.com 12 x WS2812 5050 RGB LED ring.
Sound sensor (microphone).
Android phone
Android Developer Kit