ENCPA492A Topics In Engineering: Introduction to Robotics, Remote Systems and AI Applications.

Class meeting: MWF 9:00 – 12:00 PM EDT
Lab meeting: MWF 1:00 – 4:00 PM EDT
Room: By BLACKBOARD Web Application
Class Text: Introduction to Robotics: Mechanics and Control, Fourth Edition
ISBN: 9780133489798, 0133825116
Professor: Frank Heckendorn MCEE., Department of Mathematical Sciences
Office Hours: MWF 2:00 – 5:00 PM By Web Link or Phone
Office: Off Campus, Phone 803-215-2582
Email: FrankH@usca.edu or fheck@aol.com (Best)
Prerequisite: **ELCT 221, MATH 142**

Course Description

The course encompasses the fundamentals of robotic, teleoperated, autonomous devices and AI of both fixed and mobile configuration, and the application of technologies including nuclear environments.

Course Objectives

1. Students will demonstrate an understanding of the fundamentals robotic, teleoperated, and autonomous devices of both fixed and mobile configuration, including land, air, and water deployed devices.
2. Students will demonstrate an understanding of Artificial Intelligence (AI) as applied to robotic and remote operation systems.
3. Students will understand the design concepts for, perception, sensors, computer vision, navigation, position sensing, actuation, manipulation, mobility and artificial intelligence.
4. Students will understand the control methodologies used for all forms of robotic devices.
5. Students will be able to define the appropriate robotic, remote operations and AI technologies, both design and control, for an application.
6. Students will demonstrate knowledge of the specialized requirements of hazardous or radiological deployed devices.

Topics Covered

1. Concepts of Remote Sensing and Operation in Radiological or Hazardous environments.
2. Types and applications of each type of robotic, teleoperated, or autonomous device.
3. Usage of artificial intelligence and its variants in robotic and remote operations, both fixed and mobile.
4. The current state of the art of all types of devices already deployed.
5. Common components of all types of devices and their operational capabilities.
6. Control methodologies for all types of devices.
7. Sensor technologies required for a successful robotic device.
8. Deployment of robotic devices in hazardous or radiological environments.

Grading Breakdown	
Attendance & Class Participation	30%
Virtual Design Project(s)*	30%
Exams	20%
Final Exam*	20%

*required for a passing course grade

Grading Scale	
A	100-90
B+	89-86
B	80-85
C+	79-76
C	75-70
D	69-60
F	59-0

General Information

Blackboard	Blackboard will be the main conduit for course, test and assignment communications. Blackboard will be used for student group meetings, if desired. Class PowerPoint presentations, homework assignments, and problem solutions will be available to students here.
ZOOM Virtual	ZOOM virtual environment will be used for all class meetings and discussions, if any virtual classes are required.
Lab Project(s)	Lab project(s) will be assigned on an individual or team basis for the conceptual design of robot devices including workcell, assembly, programming, and control of robotic and remote sensing devices. A written report of the effort and the outcome of the lab project(s) will be submitted. Students are encouraged to work together but copying is not allowed. **No late reports will be accepted; if you will be absent on a due date, arrange for early submission**.
Exams	Exams will be given weekly by way of virtual contact through Blackboard. If you arrive late for an exam you will not be given extra time to complete the exam. Failure to attend this exam will result in the assignment of a zero. Only extreme excuses will be entertained for a possible make-up exam. If you know ahead of time you will not be able to attend exams, check with me and I may allow an exception.
Final Exam*	The final exam will be Monday, July 25, 2022 at 9:00 AM EDT. The final exam will cover all subjects discussed during the semester. **Students who do not complete the final exam will receive a failing course grade.**
Attendance & Class Participation	Class attendance and Participation is required and represents 30% of the student's overall course grade. Class participation will be evaluated through multiple avenues, i.e. pop quizzes, collected class work, etc. Class participation activities cannot be made up after the fact. **Per departmental policy, four absences will result in a failing course grade.**
Classroom Etiquette & Expectations	Attending class regularly, preparing adequately, and completing/correcting homework assignments will improve your overall knowledge in this course and therefore your course grade. Please come to class prepared and do not come to class if you plan to complete other class work or take a nap; you will be asked to leave. Respect is expected in the classroom at all times. Students are also expected to create a positive learning environment and culture. **Coming to class late is unacceptable and is counted as an absence.**
Office Hours	Office hours will be from 1:00-4:00PM Monday/Wednesday/Friday EDT. Students are welcome to contact me at any time by phone (803) 215-2582 or by email fheck@aol.com. A virtual or face-to-face meeting will be scheduled as needed. If these times do not work with your schedule, please email me and we can set up an appointed time to meet. If a group of students would like to arrange for a group meeting with me, we can find a common time to meet. The best way to reach me is via email.
Academic Misrepresentation	You are expected to practice the highest possible standards of academic integrity. Any deviation from this expectation will result in a minimum academic penalty of your failing the assignment, and will result in additional disciplinary measures. This includes improper citation of sources, using another student's work, and any other form of academic misrepresentation. Academic misrepresentation, or cheating, is defined as copying any work, sending 'help' via text or email for any exam, accessing any electronics during testing, etc. as stated in the student handbook. As per the student handbook and the faculty manual, an incident of academic misrepresentation during an exam will result in a failing course grade and documentation added to your student file. Please see your student handbook for further details relating to academic misrepresentation and violations of the honor code.