Department:

Precision Agriculture

Course Description:

This course will prepare the student in the use of various precision farming hardware components. Basic concepts of electricity, electronics, hydraulics, and pneumatics will be covered first. Students will then get hands-on experience in the installation of display modules, guidance units, and control components. This is a project driven course which requires the students to read and understand technical manuals for the installation. Monitoring and guidance to be demonstrated include: Outback® MAX w/A321 RTK, John Deere® GreenStar™ 3 2630 w/StarFire™ 3000 RTK, Case IH® AFS™ 700, Trimble® TMX-2050, Raven® Viper Pro™, and Ag Leader® Integra™

Course Competencies:

1. Acquire and use documentation on each of the hardware systems to be used in class (field documentation, guidance, variable rate, and yield monitoring)
2. Setup, diagnose, and explain the accuracy of various guidance systems found within the Global Navigation Satellite System (GNSS) including GPS and GLONASS and how they relate to Real-time differential GPS (DGPS) receivers
3. Evaluate and diagnose basic electrical, hydraulic, and pneumatic systems
4. Install and demonstrate use of field documentation hardware systems on an appropriate implement
5. Install and demonstrate use of variable rate technology or another control hardware system on an appropriate implement
6. Install and demonstrate use of an auto-guidance hardware system on an appropriate implement
7. Set up, calibrate, and demonstrate the use of a yield monitor

Course Content:

A. Overview of Hardware and Documentation
   1) List components of precision agriculture hardware systems and research the proper function and capabilities of each
   2) Search, find and download user manuals, installation manuals, and documentation
   3) Interpret installation instructions and install hardware and software updates
B. Advanced Global Positioning
   1) Explain different Land Based Augmentation and Space Based Augmentation systems for the differential corrections

Syllabus

2) Set up an RTK base station
3) Configure a GPS receiver (COM port, Baud rate, data strings, hertz rate, and protocol) using software
4) Identify types of connections found on GPS systems

C. Basic Electricity, Hydraulics, Pneumatics, and Electricity
1) Understand the relationship between voltage and current
2) Use a multi-meter to measure voltage and current
3) Understand storage of electricity and describe different types of batteries
4) Identify control and sensor components and describe its purpose
5) Describe in general terms the data communication in a precision agriculture system
6) Identify common components of a hydraulic system
7) Diagnose and explain problems within a hydraulic system
8) Identify common components of a pneumatic
9) Explain differences between hydraulic and pneumatic systems

D. Field Documentation Systems
1) Install display/controller and Differential GPS in a tractor or other agricultural machine
2) Create operation, task, and inputs in display
3) Record geo-referenced field boundary and field operation

E. Control Systems
1) Install Auto Shutoff air clutches or hydraulic drive to a planter
2) Evaluate the placement and connections of a control wiring harness

F. Guidance Systems
1) Install auto-steer and a guidance system in a tractor or other agricultural machine
2) Set parameters and calibrate the device
3) Use the guidance system to set an AB line and use it in an open field

G. Yield Monitoring
1) Set up field structure and variety inputs into controller
2) Calibrate yield monitor
3) Diagnose and resolve DGPS problems

Learning Assessments:

A. Discussion Questions
B. Graded Assignments
C. Comprehensive Assignments
D. Research Paper/Projects/Presentation/Portfolio
E. Quizzes and Exams

Instructional Materials:

Syllabus

Guidelines for Requesting Accommodations Based on Documented Disability or Medical Condition

It is the intention of Highland Community College to work toward full compliance with the Americans with Disabilities Act, to make instructional programs accessible to all people, and to provide reasonable accommodations according to the law.

Students should understand that it is their responsibility to self-identify their need(s) for accommodation and that they must provide current, comprehensive diagnosis of a specific disability or medical condition from a qualified professional in order to receive services. Documentation must include specific recommendations for accommodation(s). Documentation should be provided in a timely manner prior to or early in the semester so that the requested accommodation can be considered and, if warranted, arranged.

In order to begin the process all students **must** complete the "Disabilities Self-Identification Form" at this link: https://highlandcc.edu/pages/disability-services.

This form can also be accessed at the Highland Community College homepage under Students Services/Student Resources/Disability Service or by contacting the Disabilities Coordinator.