

PAG 315 Electronic Systems in Precision Ag Precision Ag. Program

Course Information:

Course Prefix: PAG

Catalog Number: 315

Course Credits: 3

Time and Place: Tuesday and Thursday

9:30AM – 10:20AM, LADD 107

Lab: Wednesday 2:00PM – 3:50PM,

LADD 201

Instructor:

Dr. Xin (Rex) Sun and Dr. Nitin Rai

Email: xin.sun@ndsu.edu; nitin.rao@ndsu.edu

Phone Number: 701-231-5756

Office: LADD Hall 101H and 208c

Office Hours: Monday 11:00AM – 12:00 PM,

LADD Hall 101H

Bulletin Description:

This course is designed to introduce the student to understand the basics of electronic systems and applications in precision ag. The students will learn topics like signal processing, electric motor, serial control and communications data network for tractors and machinery for agriculture applications. The course is offered in two 50 mins lectures and one 100 mins laboratory per week.

Course Prerequisite:

- PHYS 120 Fundamentals of Physics

Course Objectives:

After successfully completing this course, the students will be able to

1. explain the principles and applications of electronic systems like capacitors, resistors, transistors, and other electronic components.
2. apply hands-on experience in electronic microcontrollers, multimeters, and monitor systems in precision ag like Arduino electronic platform, Ag Leader InCommand 1200 system, CASE IH AFS Pro 700 system.

Pedagogical Style:

- This is primarily a lecture-discussion class. The first 5-10 min of each lecture will be dedicated to the class discussion of student questions and review of the previous lecture.
- Students should feel free to ask questions at any time during lectures.
- This classroom is a place where you will be treated with respect and individuals of all ages, backgrounds, national origins, religious affiliations, sexual orientations, abilities, and other

visible and nonvisible differences are welcome. All members of this class are expected to contribute to a welcoming and inclusive environment for every other member of the class.

Class Materials and Indicated Software:

1. Textbook: Electronic and Electrical Systems (10th Edition) (Recommend, not required)
 Authors: Deere & Company
 Publisher: Deere & Co, 1993
 ISBN: 0-86691-409-9; 978-0-86691-409-3

Outcomes:

Students will better understand the electrical systems of the farm vehicles, trucks and farm operating machines. The students will learn how to safely work with electrical systems, how to measure the electron and diagnosing circuits. In addition, students will learn sensors and different display systems on the farming machinery equipment.

Syllabi on Web Pages:

The course syllabus, class topic presentations will be available at Blackboard.

Evaluation Procedures and Grading Criteria

Assignment Policy:

The due dates for homework and projects will be given with the assignments. Late assignments will be accepted with a 10% deduction of total assignment points per NDSU class day. All assignments must be submitted before 5 p.m. on the due date. Late assignments will not be accepted after solutions are posted/handed out/discussed or after 2 NDSU class days from the date they are due.

You are encouraged to work together with others for your homework and lab assignments because that will help you learn. Although students are encouraged to work together and assist one another with assignments, all work submitted should be created by that individual. If it is apparent that work has simply been copied from other's work, all students involved will receive 0 points for that assignment.

Grading Policy:

The course work consists of the following six categories: 1) homework 2) unannounced quizzes, 3) oral presentation and written assignments, 4) midterm exams, and 5) lab assignment, 6) a comprehensive final exam. The oral presentation requires each student to select one topic in the scope of the class contents and give a 15-minute presentation. The possible points can be earned for all work categories are listed in the table below.

Work category	Possible Points
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1. Homework (2 HomeWorks; 50 points each)	100
2. Quizzes (unannounced, 2 quizzes; 50 points each)	100
3. Oral presentation (50 points) and written assignments (50 points)	100
4. Midterm exam	100
5. Lab assignment (5 quizzes; 20 points each)	100
6. Final exam (comprehensive)	200
Total	700

Each student's final letter grade will be determined by the percentage of the total earned points over the total possible points using the following grading scale:

Grading Scale	Grade Percentage of Total Points for the Course
A	90% and above
B	80% through < 90%
C	70% through < 80%
D	60% through < 70%
F	Less than 60%

Exam Policy:

Quizzes will not be announced ahead of time and make-up quizzed will be given at appropriate time. As for scheduled midterm and final exams, missed exams will receive 0 points unless missed for a valid justification and the instructor is notified prior to the date and time of the exam. Valid justification is a statement indicating illness, obituary notice (death in family or loved one), or co-curricular activities. For such justified reasons, a make-up exam may be given at a mutually acceptable time or the weight of the missed mid-term exam will be shifted to the final exam. Extracurricular activities, weddings, vacations, hunting and fishing trips, work, dentist's appointments, and undocumented car-related incidents are examples of unacceptable reasons for missing the scheduled dates and times for exams. No participation points or make up quiz will be given under unexcused absence. The instructor reserves the right to determine whether the excuse is legitimate or not. The grades for group design projects may be adjusted individually based on group feedback.

Attendance and Late Assignments:

Attendance in classes is expected and important. (The term "class" includes class, online class, laboratory, field trips, group exercises, or other activities.) However, there are instances in which students are unable to attend class and in which those absences will be excused. These instances are described in policy 333 (<https://www.ndsu.edu/fileadmin/policy/333.pdf>). Absences not covered by this policy are excusable at the discretion of the instructor. However, class policies regarding class absence are provided below. (Note: NDSU Student Health Service does not provide students with excuses for class absences or tardiness due to illness or injury.)

If you will be missing class for a university club or team event or other excusable reason to be determined by the instructor, you must let the instructor know *before* you miss class. Consideration will be given to those students who have a *valid emergency* (severe illness or a death in the family) as their reason for a late assignment.

“Other excusable reason to be determined by the instructor or presented in policy 333, you must let the instructor known in advance.” The course instructor must clearly inform students on the first day of class and in writing in the syllabus of their (1) policy regarding class absence and (2) policy, if any, for making up missed assignments. If class attendance is a component of the course grade, the course instructor must clearly communicate this to the class in writing in the syllabus. See NDSU Policy 333 for faculty and student responsibilities related to attendance, including for university-sponsored activities.

Specify steps to take regarding student illness.

- If you are unable to attend class at the regularly scheduled time due to illness, contact the instructor for alternate arrangements, including recordings of class sessions and assignments as well as accommodations and extensions as needed.

Additional Resources for Students

- As a member of the NDSU community, resources are available for you should you need help in dealing with adverse reactions to things happening in the world today. A variety of resources are listed below:

For students on campus and remotely (telehealth):

Counseling Services: 701-231-7671; <https://www.ndsu.edu/counseling/>

Disability Services: 701-231-8463; <https://www.ndsu.edu/disabilityservices/>

Student Health Service: 701-231-7331; <https://www.ndsu.edu/studenthealthservice/>

Dean of Students Office: 701-231-7701; <https://www.ndsu.edu/deanofstudents/>

In a crisis or emergency situation:

Call University Police: 701-231-8998

Call 9-1-1

Go to a Hospital Emergency Room

Go to Prairie St. Johns for a Needs Assessment: 701-476-7216 (510 4th St. S.)

Call the FirstLink Help Line: 1-800-273- TALK (8255) or 2-1-1

Call Rape and Abuse Crisis Center: 701-293-7273

Tentative Course Topics and Schedule*:

Schedule is Weather and Lecturer Dependent (Subject to change)		
Dates	Week	Topics
Aug 25 th , 2020	1	Course Introduction

Aug 27 th , 2020	1	Guest Lecture
Sep 1 st , 2020	2	Electrical Safety
Sep 3 rd , 2020	2	Electricity—How It Works
Sep 8 th , 2020	3	Electrical Components1
Sep 10 th , 2020	3	Electrical Components2
Sep 15 th , 2020	4	Electromechanical Components1
Sep 17 th , 2020	4	Electromechanical Components2
Sep 22 nd , 2020	5	Storage Batteries
Sep 24 th , 2020	5	Charging Circuits
Sep 29 th , 2020	6	Starting Circuits
Oct 1 st , 2020	6	Ignition Circuits
Oct 6 th , 2020	7	Electronic Ignition and Fuel Injection Systems
Oct 8 th , 2020	7	Lighting and Accessory Circuits
Oct 13 th , 2020	8	Connectors
Oct 15 th , 2020	8	General Maintenance
Oct 20 th , 2020	9	Diagnosis and Testing of Systems
Oct 22 nd , 2020	9	Midterm Exam
Oct 27 th , 2020	10	Introduction to Mathematics for Controllers
Oct 29 th , 2020	10	Electronic Components
Nov 3 rd , 2020	11	Sensors
Nov 5 th , 2020	11	Controllers and Monitors1
Nov 10 th , 2020	12	Controllers and Monitors2
Nov 12 th , 2020	12	Hybrid Systems
Nov 17 th , 2020	13	Hybrid Systems
Nov 19 th , 2020	13	Guest lecturer
Nov 24 th , 2020	14	Student presentation
Nov 26 th , 2020	14	Student presentation
Dec 8 th , 2020	15	Dead Week – Class Review
Dec 10 th , 2020	15	Q/A for Students
Dec 15 th , 2020	16	Final Examinations

*Except for examination dates, the above course schedule is subject to change

Lab Schedule (Schedule is Weather and Industry Dependent)	
Subject to change	
Week	Topic
1	Course Introduction
2	Electrical Basics
3	Electrical Basics
4	Batteries
5	Sensors
6	Farm equipment

7	Field Trip1
8	Field Trip2
9	Field Trip3
10	Guest Lecture
11	Farm equipment display system demo 1
12	Farm equipment display system demo 2
13	Farm equipment display system demo 3
14	Robotic Platform Demo
15	Guidance System Demo
16	Group Discussion

Americans with Disabilities Act for Students with Special Needs:

Any students with disabilities or other special needs, who need special accommodations in this course, are invited to share these concerns or requests with the instructor and contact the Disability Services Office (www.ndsu.edu/disabilityservices) as soon as possible. Assistance is also available from Disability Services in lower level of main library, suite 17 (231-8463). <http://www.ndsu.edu/disabilityservices/>

Veterans and Military Personnel:

Veterans or military personnel with special circumstances or who are activated are encouraged to notify the instructor as early as possible.

Academic Honesty:

All students taking any course in the College of Agriculture, Food Systems, and Natural Resources are under the Honor System (<http://www.ag.ndsu.edu/academics/honor-system-1>). The Honor System is a system that is governed by the students and operates on the premise that most students are honest and work best when their honesty, and the honesty of others, is not in question. It functions to prevent cheating as well as penalize those who are dishonest. It is the responsibility of the students to report any violations of the honor pledge to the instructor, honor commission or the Dean of the College of Agriculture, Food Systems, and Natural Resources. The academic community is operated on the basis of honesty, integrity, and fair play.

NDSU Policy 335: Code of Academic Responsibility and Conduct applies to cases in which cheating, plagiarism, or other academic misconduct have occurred in an instructional context. Students found guilty of academic misconduct are subject to penalties, up to and possibly including suspension and/or expulsion. Student academic misconduct records are maintained by the Office of Registration and Records. Informational resources about academic honesty for students and instructional staff members can be found at www.ndsu.edu/academichonesty.

Use of Cell Phones, iPods, MP3 Players, and Other Electronic Devices:

All participants in this class are subject to NDSU University Senate Policy 158: Acceptable use of Electronic Communications Devices (<http://www.ndsu.edu/fileadmin/policy/158.pdf>).

As a courtesy to other students and the instructor, all cell phones, iPods, MP3 players, and other electronic devices except handheld calculators should be turned off or placed in a vibrate-only mode during class time. Initiating phone calls, text message, or other types of messages during class time -including those to friends, family, classmates, coworkers, or supervisors—is unacceptable unless there is a genuine emergency. Examples of emergencies include weather-related school closing announcements; fire, bomb, or other threats to public safety and well-being; and other incidents in which the NDSU system is or could be activated to provide broadcast messages to the NDSU community.

Use of cell phones or other portable electronic devices for communication, transmission, retrieval, or storage of information during the administration of a test or quiz may be considered an incident of **academic dishonesty**. One exception to this policy is the use of handheld calculators for computational purposes. Use of cell phones or similar devices as a calculator during tests and quizzes will not be allowed because it is difficult to distinguish such activity from sending and receiving text messages, which could obviously be interpreted as a form of academic dishonesty.

Dead Week Policy:

The NDSU Dead Week policy is available at <http://www.ndsu.edu/registrar/dates/deadweek/>.

Dates & Deadlines

<https://www.ndsu.edu/registrar/dates/>