PAG 315 Electronic Systems in Precision Ag.

Precision Ag. Program

Course Information
Course Prefix: PAG
Catalog Number: 315
Course Credits: 3 cr.
Lecture (D/T/P[1]): Tue. & Thu., 9:30 AM-10:20 AM, Ladd Hall 209
Lab (D/T/P): Wed., 2 PM-3:50 PM, Ladd Hall 201

Instructor Information
Instructor: Dr. Nitin Rai
nitin.rai@ndsu.edu

Bulletin Description:

This course is designed to introduce the student to understand the basics of electronic systems and applications in precision agriculture. 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:

1. PAG 215 Mapping of Precision Ag. Data

Course Objectives:

1. Students will learn the principles and applications of electronic systems like capacitors, resistors, transistors, and other electronic components.
2. Students will have hands-on experience in electronic systems like Ag Leader InCommand 1200 system, CASE IH AFS Pro 700 system.

Pedagogical Style:

1. 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.
2. Students should feel free to ask questions at any time during lectures.
3. 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.

[1] Date/Time/Place

Class Remote Access Link:

Join Zoom Meeting
Meeting ID: 988 0100 3898
Passcode: 593389

Class Materials and Indicated Software:

1. Textbook: Electronic and Electrical Systems (10^{th} Edition) *(Recommended but 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.

Communication due to COVID-19 pandemic:

Currently, NDSU is strongly recommending that all people wear masks in indoor spaces when social distancing cannot be maintained. Further, faculty may require masks to be worn in their classes at their discretion. In case of any changes, you will be notified and this syllabus will be updated. Consistent with NDSU's recommendations, in this class all participants, including those who are fully vaccinated, are required to wear a face covering. If you fail to properly wear a face covering, you will not be admitted to the classroom. Given the changing conditions associated with the pandemic, this class' faculty member has reserved the right to modify the mask status of the class

during the semester. The following will be used as needed: referral to Dean of Students Office or administrative removal from class.

1. Students who cannot wear a face covering due to a medical condition or disability, or who are unable to remove a mask without assistance may seek an accommodation through the Disability Services (701-231-8463; https://www.ndsu.edu/disabilityservices/).

2. In accordance with NDSU Policy 601, failure to comply with instructions, including the mask requirement, may be handled according to the Code of Student Conduct resolution process and may result in disciplinary sanctions.

3. You may meet with me virtually using the Blackboard Collaborate Virtual Classroom or Zoom during office hours. *(Zoom link as mentioned above).*

Grading Policy:

The course work consists of the following five 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 table 1:

Work category	Possible points
Homework (2 homework worth 50 pts. each)	100
Quizzes (unannounced, 2 quizzes worth 50 pts. each)	100
Oral presentation & written assignment (50 pts. each)	100
Midterm exams	100
Lab assignments (5 quizzes woth 20 pts. each)	100
Final exam (comprehensive)	200
Total	**700**

Table 1: Table with grade point categories.

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 cocurricular 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.

1. In this course Blackboard will be used for assignment submission (and grading) for all students (for both face-to-face and remote participants).

2. If you are sick, do not come to class or campus to turn in work. Instead notify the course instructors as soon as practical, so that accommodations can be made.

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).

1. Students are expected to attend every class and remain in class for the duration of the session when it is safe to do so in accordance with NDSU guidance regarding COVID19.

2. In this course students should participate in the course mostly face-to-face. When needed, students are also able to participate virtually in synchronous or asynchronous discussions and activities and submit assignments virtually.

3. While the late participation policy for this course is outlined below, please note that I will be flexible regarding deadlines for students who are experiencing illness or other challenges related to COVID-19. Please contact me as early as possible if you think you may not be able to complete an assignment or participate in the course due to illness. This semester due to COVID-19, I do not have an attendance policy as I normally would. Do not come to class if you are sick. You can view the lectures remotely and ask any questions you have on Backboard Ultra (or Zoom).

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:

1. 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.

2. Do not come to class if you are sick. Please protect your health and the health of others by staying home and participate in class remotely. For information on COVID-19, symptoms, testing, and steps to stay healthy.

3. Do not come to class if you have been exposed to individuals who tested positive for COVID19 and/or you have been notified to self-quarantine due to exposure.

If you are absent from class as a result of a COVID-19 diagnosis or quarantine, the decision for approval of all absences and missed work is determined by the course instructor. As instructor, I will do the following to help you make progress in the course:

- You will be able to participate in class remotely.
- You will be able to submit assignments and take exams remotely.
- Other remote learning options will be determined on a case-by-case basis.

HyFlex Options:

- If you are at high risk of contracting COVID-19 (and/or of infecting someone who is high risk), you have the option of attending class remotely. You may opt to do so at the beginning of the semester or as the need arises during the semester.
- To participate in HyFlex instruction remotely, you must have access to the requisite technology, including a laptop/computer with a functioning microphone, speakers (or headphones) and webcam, as well as reliable internet access.
- To opt for the remote learning experience in this course inform the course instructor via email as soon as possible.
- acemask is recommended, but not required. Please go to the link (https://kb.ndsu.edu/learn) web resource for students on HyFlex compiled by IT.

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

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 (https://www.ndsu.edu/academichonesty/)

Tentative Course Topics and Schedule:

Dates	Week	Topics
Jan. 11th, 2024	1	Course Introduction
Jan. 16th, 2024	2	Electrical Safety
Jan. 18th, 2024	2	Electricity - How It Works
Jan. 23rd, 2024	3	Electrical Components - PI
Jan. 25th, 2024	3	Electrical Components - PII
Jan. 30th, 2024	4	Electrochemical Components - PI
Feb. 1st, 2024	4	Electrochemical Components - PII
Feb. 6th, 2024	5	Storage Batteries
Feb. 8th, 2024	5	Charging Circuits
Feb. 13th, 2024	6	Starting Circuits
Feb. 15th, 2024	6	Ignition Circuits
Feb. 20th, 2024	7	Electronic Ignition and Fuel Injection Systems
Feb. 22nd, 2024	7	Lighting and Accessory Circuits
Feb. 27th, 2024	8	Connectors
Feb. 29th, 2024	8	**Midterm Exams**
Mar. 4-8th, 2024	9	**Spring Break**
Mar. 12th, 2024	10	General Maintenance
Mar. 14th, 2024	10	Diagnosis and Testing of Systems
Mar. 19th, 2024	10	Introduction to Mathematics for Controllers
Mar. 21th, 2024	10	Electronic Components
Mar. 26th, 2024	11	Sensors
Mar. 28th, 2024	11	Controllers and Monitors - PI
Apr. 2nd, 2024	12	Controllers and Monitors - PII
Apr. 4th, 2024	12	Hybrid Systems - PI
Apr. 9th, 2024	13	Hybrid Systems - PII
Apr. 11th, 2024	13	Guest Lecture
Apr. (16th, 18th, 23rd, and 25th)	—	
Apr. 30th and May 1st	—	Dead Week — No Classes
May (6th - 10th)	—	**Final Exams**

Tentative Lab Objectives and Schedule:

Dates	Week	Topics
Jan. 17th, 2024	1	No Lab
Jan. 24th, 2024	2	Introduction to Electronics and Electronics Design Software "Fritzing"
Jan. 31st, 2024	2	Introduction to Arduino Uno and Programming Interface
Feb. 7st, 2024	4	Programming Analog Input and Output with Microcontrollers
Feb. 14th, 2024	5	Servo Motor Control with Potentiometer and Ultrasonic Distance Sensor
Feb. 21st, 2024	6	Arduino exercise with stepper motor: Type of motors and how they work
Feb. 28th, 2024	7	Displaying temperature and humidity on a LCD
Mar. 13th, 2024	8	Introduction to water sensors
Mar. 20th, 2024	9	Circuit Design with Electronic Switch and Programming
Mar. 27th, 2024	10	Introduction to AgLeader in Command
Apr. 3rd, 2024	11	Introduction to Multimeter
Apr. 10th, 2024	12	TBA
Apr. 17th, 2024	13	TBA
Apr. 24th, 2024	14	Student Presentation
May 1st, 2024	15	No Lab
May 8th, 2024	16	Finals Week

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 (https://www.ndsu.edu/onestop/dead-week-policy).