

Fall 2022: ECE 639 Error Control Coding (CRN: 25576)

Section 004: Mon, Wed, Fri 11:30am–12:20pm @BHEE224

https://engineering.purdue.edu/~chihw/22ECE639F/22F_ECE639.html

- **Contact Information**

Prof. Chih-Chun Wang
MSEE 354
Email: chihw@purdue.edu

- **Office hours:** MWF 1:30-2:20pm. The zoom link can be found in the course webpage in the top of this syllabus.

- Course objectives, course schedules, and basic requirements can be found in the following accompanying document, which is also part of the syllabus, even though it is not printed on paper explicitly:

<https://engineering.purdue.edu/ECE/Academics/Undergraduates/UGO/CourseInfo/courseInfo/UGO?courseid=170&show=true&type=grad>

- Basic technology tools:

- **All announcements will be made via the following tools:**

1. During the lectures;
2. Via the faculty-maintained course webpage (link in the top of the syllabus). (NOT in the Brightspace.)

- All the HW assignments will be submitted physically during the lectures.
- The “Grades” will be maintained centrally in Brightspace.
- The “Office Hours” will be hosted via Zoom, the link can be found in the course webpage (link in the top of the syllabus).

- **Content:**
 - You will learn the Shannon capacity theorem, in a very succinct way;
 - The difference between different types of decoder, ML, MAP, min-distance, etc.;
 - Several important algebraic codes: Hamming codes, Reed Muller Codes; BCH codes
 - Convolutional codes, Viterbi decoders, and BCJR decoders;
 - Low-Density Parity-Check (LDPC) codes and the corresponding message passing decoders.

 - **Attendance:** Attendance will not be used in anyway in this course.

 - **Homework:** We will have 8–10 homework is scheduled during the regular lectures. Collaboration is highly encouraged, but each student must write and turn in their own homework.

 - **Final project:** There will be a final project. Each student must complete his/her own project by him/herself. The project can be based on literature survey, implementation and numerical evaluation of some of the existing codes, and/or new research ideas. The format of the project must be using a single-paged letter-sized paper format with 11-point fonts and no longer than 10 pages.

 - **Exam Dates:** There will be two midterms evenly spaced throughout the semester. The dates are to be decided later.

 - There will be no BoilerCast support since the lectures will be conducted using chalk-and-board. However, all lecture notes will be posted and also the instructor has 3 office hours every week and students are welcome to use the office hours to discuss any topics of error control coding. Therefore, if you miss any of the lectures, it is not a big deal and you can easily work on the lecture notes by yourselves and attend the Zoom-based office hours to catch up with the materials.
- Please do not attend the lecture if you have any COVID-related symptoms. Attending the lectures when being sick will not help much about your learning and will put your classmates and the instructor at risk. It is a very small class and the instructor can definitely work with the students to address each student's special needs.
- **Grading:** Homework — 20%; MT1: 25%, MT2: 25%, Final Project 30%.

 - **Letter grade system:** ECE639 uses the traditional letter grade system, not the plus/minus system.

- **Brightspace:** Brightspace will be used exclusively for disseminating the scores of HW and midterms. Please constantly check your scores in Brightspace to ensure that we record your scores correctly. The scores in Brightspace will be used to decide your final letter grade. The instructors do not keep any record of your grades in his/her local computers.

Since your final letter grade will be decided based on your HW, midterms, and final scores in Brightspace, please use your scores in Brightspace as a graded feedback between the 5th and 7th week of the semester. Students can thus have some sense of his/her performance in this course before the drop date.

Your scores of the first 2 HWs will be recorded in Brightspace and they will also be used as the main metric for reporting Initial Course Participation (ICP). If ICP is critical to your financial aids, make sure you take MT1 and turn in the first few homework assignments.

- **Email list and the course website:** The Purdue Brightspace is mostly used for disseminating the grades. Almost all of the announcements and/or HW assignments will be made on my personal course website or through the Brightspace email list.

It is the students' responsibility to check the course website:

https://engineering.purdue.edu/~chihw/22ECE639F/22F_ECE639.html

on a weekly basis to obtain the latest course information.

- **Textbook usage:** We have a recommended textbook

Error Control Coding, 2nd Edition, Shu Lin and Daniel J. Costello, Jr., Pearson Prentice-Hall, 2004, ISBN No. 0-13-042672-5.

The homework assignments are based on the problem set of the textbook. The students are welcome to borrow the textbook from the instructor to write-down the problem assignments.

Many students in the past told me that with the weekly lecture notes published online, there was no need for them to use the textbook. If you feel the same way, you can just photocopy the problem sets of the textbook and it will be sufficient.

There is no need to purchase the textbook!

- **Make-up exam policy:** In general, no make-up exam will be given. Only under exceptional conditions will an oral make-up exam be given. In the past, students generally felt that an oral make-up exam was much harder than the written exam due to the nature of the oral exam.

- **Purdue Honors Pledge:**

As a boilermaker pursuing academic excellence, I pledge to be honest and true in all that I do. Accountable together - we are Purdue.

- **Other detailed rules and policies of this class:**

- **Phone policy:** Please refrain from taking phone calls during the class. Cell phones and computers are allowed. Just no talking.
- **Office hours:** Please take full advantage of the office hours before trying to set up an individual appointment. The instructor may not be available in the last minutes before an exam or any particular due dates.
- **Answering doubts / last-minute questions:** Prof. Chih-Chun Wang will not answer any doubt / last-minute questions 24 hours before the exam except during the office hours. The student should start to prepare for the exam as early as possible. Do not wait until the last minute.
- During the exam, a digital picture may be taken for the entire classroom.

- **Academic Dishonesty:**

The ECE faculty expects every member of the Purdue community to practice honorable and ethical behavior both inside and outside the classroom. Any actions that might unfairly improve a student's score on homework, quizzes, or examinations will be considered cheating and will not be tolerated. Examples of cheating include (but are not limited to):

- Sharing / passing any information during an examination.
- **Looking around unnecessarily during an exam.** The instructor and the TA may ask the student to concentrate on the exam booklet during the exam.
- Using forbidden material or devices to an examination. (Calculators and help sheets are prohibited during the exam.)
- Using cellular phones, and other non-essential electronics during an examination.
- Collaboration for homework questions is encouraged, but the students **MUST** hand write / type their own homework separately.
- Working on an exam before or after the official time allowed.
- Requesting a re-grade of answers or work that has been altered.

At the instructor's discretion, cheating on an assignment or examination will result in a reduced score, a zero score, or a failing grade for the course. All occurrences of academic dishonesty will be reported to the Assistant Dean of Students and copied to the ECE Associate Head for Education. If there is any question as to whether a given action might be construed as cheating, please see the instructor or the teaching assistant before you engage in any such action.

Purdue prohibits "dishonesty in connection with any University activity. Cheating, plagiarism, or knowingly furnishing false information to the University are examples

of dishonesty.” [Part 5, Section III-B-2-a, Student Regulations] Furthermore, the University Senate has stipulated that “the commitment of acts of cheating, lying, and deceit in any of their diverse forms (such as the use of substitutes for taking examinations, the use of illegal cribs, plagiarism, and copying during examinations) is dishonest and must not be tolerated. Moreover, knowingly to aid and abet, directly or indirectly, other parties in committing dishonest acts is in itself dishonest.” [University Senate Document 72-18, December 15, 1972]

Academic integrity is one of the highest values that Purdue University holds. Individuals are encouraged to alert university officials to potential breaches of this value by either emailing integrity@purdue.edu or by calling 765-494-8778. While information may be submitted anonymously, the more information that is submitted provides the greatest opportunity for the university to investigate the concern.

<https://www.purdue.edu/odos/academic-integrity/>

General Course Policy For All Purdue Courses

- **Campus Emergency Preparedness:**

For any emergency call 911.

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances. In such an event, information will be provided through the course website and through the course email list.

Students are encouraged to stay home if having any COVID-19 symptoms.

- **Grief Absence Policy for Students:**

Purdue University recognizes that a time of bereavement is very difficult for a student. The University therefore provides the following rights to students facing the loss of a family member through the Grief Absence Policy for Students (GAPS). GAPS Policy: Students will be excused for funeral leave and given the opportunity to earn equivalent credit and to demonstrate evidence of meeting the learning outcomes for missed assignments or assessments in the event of the death of a member of the student's family.

See the University's website for additional information:

http://www.purdue.edu/studentregulations/regulations_procedures/classes.html

- **Violent Behavior Policy:**

Purdue University is committed to providing a safe and secure campus environment for members of the university community. Purdue strives to create an educational environment for students and a work environment for employees that promote educational and career goals. Violent Behavior impedes such goals. Therefore, Violent Behavior is prohibited in or on any University Facility or while participating in any university activity.

See the University's website for additional information:

<http://www.purdue.edu/policies/facilities-safety/iva3.html>

- **Accessibility and Accommodations:**

Purdue University strives to make learning experiences as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, you are welcome to let me know so that we can discuss options. You are also encouraged to contact the Disability Resource Center at: drc@purdue.edu or by phone: 765-494-1247.

- **Nondiscrimination:**

Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity,

understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her own potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life. Purdue University views, evaluates, and treats all persons in any University related activity or circumstance in which they may be involved, solely as individuals on the basis of their own personal abilities, qualifications, and other relevant characteristics. Purdue University prohibits discrimination against any member of the University community on the basis of race, religion, color, sex, age, national origin or ancestry, genetic information, marital status, parental status, sexual orientation, gender identity and expression, disability, or status as a veteran. The University will conduct its programs, services and activities consistent with applicable federal, state and local laws, regulations and orders and in conformance with the procedures and limitations as set forth in Purdue's Equal Opportunity, Equal Access and Affirmative Action policy which provides specific contractual rights and remedies. Additionally, the University promotes the full realization of equal employment opportunity for women, minorities, persons with disabilities and veterans through its affirmative action program.

Any question of interpretation regarding this Nondiscrimination Policy Statement shall be referred to the Vice President for Ethics and Compliance for final determination.

You may want to refer students to Purdue's nondiscrimination statement:

http://www.purdue.edu/purdue/ea_eou_statement.html

- **Counseling and Psychological Services (CAPS) Information:** Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of support, services are available. For help, such individuals should contact Counseling and Psychological Services (CAPS) at (765)494-6995 and <http://www.purdue.edu/caps/> during and after hours, on weekends and holidays, or by going to the CAPS office of the second floor of the Purdue University Student Health Center (PUSH) during business hours.
- **Basic Needs Security:** Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact the Dean of Students for support. There is no appointment needed and Student Support Services is available to serve students 8 a.m.–5 p.m. Monday through Friday. Considering the significant disruptions caused by the current global crisis as it related to COVID-19, students may submit requests for emergency assistance from the Critical Needs Fund.
- **Disclaimer** This syllabus is subject to change.