



ECE 8210: DIGITAL COMMUNICATIONS II

Section 001

Spring 2021

MEETING TIME: T/TH 5:00-6:15 p.m.

MEETING LOCATION: Riggs 223

INSTRUCTOR(s): Daniel Noneaker, Riggs 117-D, dnoneak@clermson.edu, (864)656-0100

OFFICE HOURS AND PROCEDURES: T/Th 4:00-5:00 p.m. or by appointment. Zoom or in-person as requested by student.

COURSE MODALITY: BLENDED/HYBRID

COURSE DESCRIPTION: Modern communications systems emphasizing modulation and methods of taking into account effects of noise on various systems. Continuation of both ECE 4300/6300 and ECE 8200.

COURSE PREREQUISITES: ECE 4300/6300 or ECE 8200

STUDENT LEARNING OUTCOMES: At the completion of the course, students should be able to model and evaluate the performance of a digital communication system employing multidimensional signaling and either coherent or noncoherent communications; evaluate the effects of non-selective fading suboptimal filtering; model and evaluate the effect of intersymbol interference, partial-response signaling, and equalization; and model and evaluate the performance of a digital communication system employing spread-spectrum modulation.

REQUIRED MATERIALS: **M. B. Pursley, *Introduction to Digital Communication*, Pearson Prentice Hall, 2005.**

Each student is required to have a laptop computer, internet connectivity capable of transmitting and receiving video, a video camera, a microphone, and a cell phone.

TOPICAL OUTLINE:

| | Textbook reading |
|---|------------------|
| Jan. 7: Two-Dimensional RF Modulation (review) | 6.5 |
| Jan. 12, 14: M-ary Orthogonal Signaling with Coherent Demodulation | 6.6 |
| Jan. 14, 19: Bandwidth-Efficient RF Modulation | 6.7, 6.8 |
| Jan. 19, 21, 26: Introduction to Noncoherent Communications | 7.1—7.4 |
| Jan. 28, Feb. 2, 4, 9: Error Probabilities for Noncoherent Demodulation | 7.5 |
| Feb. 9: Differentially Coherent BPSK | 7.6 |
| Feb. 11, 16: M-ary Orthogonal Noncoherent Communications | 7.7 |
| Feb. 16, 18: Envelope Detector for FSK | 7.8 |
| Feb. 23: MID-TERM EXAM | |
| Feb. 25, Mar. 2: Nonselective Fading | 7.9 |
| Mar. 4, 9: Suboptimal Filters | 8.1—8.2.1 |
| Mar. 9, 11: Intersymbol Interference | 8.1—8.2, * |

| | |
|---|------------|
| Mar. 16, 18: SPRING BREAK | |
| Mar. 23: Intersymbol Interference (continued) | 8.1—8.2, * |
| Mar. 25: Partial-Response Signaling | 8.3, * |
| Mar. 30, Apr. 1: Linear Equalization | 8.4 |
| Apr. 6, 8, 13, 15, 20, 22: Spread-Spectrum Communications | 9, * |
| Apr. 29, 7:00-9:30 p.m.: FINAL EXAM | |

* supplemental notes and reprints, handed out as required

GRADING POLICY: Course letter grade scale -- A: 90-100, B: 80-89.9, C: 70-79.9, F: <70; Grading weights -
- homework - 20%, mid-term exam - 30%, final exam – 50%.

EXAM POLICY: Both the mid-term exam and the final exam will be given online. A make-up for a scheduled exam will only be allowed for urgent reasons. Make-up exams must be requested and taken before the scheduled exam date. The final exam must be taken at the scheduled time. (See the one exception below.)

HOMEWORK POLICY: Collaboration with your classmates on homework assignments IS allowed. However, consultation is permitted only with students who are currently enrolled in ECE 8210. No material from previous offerings of ECE 8210 may be used. Each student must develop and write up each homework solution independently. No copying of solutions from others is allowed, even if the solutions are obtained as a result of collaboration. Each homework assignment must be turned in at the start of class on the date it is due. Late homework will **not** be accepted.

DELAYED EXAM OR HOMEWORK DUE TO INCLEMENT WEATHER: Any exam that was scheduled a campus- wide emergency (such as inclement weather) will be given at the next class meeting unless contacted by the instructor. Any assignments due at the time of a class cancellation due to inclement weather will be due at the next class meeting unless contacted by the instructor. Any extension or postponement of assignments or exams must be granted by the instructor via email or Canvas within 24 hours of the weather-related cancellation.

REUSE FROM PRIOR COURSES: No work from previous or other current courses may be reused as material submitted for a grade in this course.

DISAGREEMENTS REGARDING GRADING: Any student who disagrees with the grading of a homework assignment, project, or exam must contest the grading within one week of the date on which the graded material is returned to the class. This must be done by returning the original graded material to the instructor accompanied by a *written* description of the student's disagreement that is sufficiently detailed to allow accurate consideration of the claim.

LECTURE CANCELLATION POLICY: A lecture is cancelled if the instructor is more than 15 minutes late.

COURSE CONTENT LOCATION: Handout materials, assignments, and online exam materials will be distributed via Clemson Canvas, which will also be the mechanism for course announcements.

- Primary access link: www.clemson.edu/canvas
- Secondary access link, if needed: <https://clemson.instructure.com/>
- You can also use the Canvas Student App.

ATTENDANCE POLICY:

1. The course lectures will be available for in-person attendance (but see item 2 below), via live synchronous delivery on Zoom, and via recordings posted on the course Canvas page.

2. The University will assign each student a day or days of the week when they are allowed to attend lectures of the course in person; on other days, their attendance is restricted to online.
3. In-person attendance (when permitted) and synchronous online attendance are *not* required, but each student is responsible for understanding the content of each lecture.
4. If a class is cancelled on an exam date, subsequent arrangements will be made to give the exam on a later class date.
5. Whenever possible, each student should use the Notification of Absence module in Canvas or email to inform the instructor an upcoming absence from a course lecture.
6. To maintain physical distancing in the classroom, individuals arriving first to the classroom should sit farthest from the door. Similarly, at the conclusion of class, students closest to the door should leave first.
7. While on campus, face coverings are required in all buildings and classrooms. Face coverings are also required in outdoor spaces where physical distance cannot be guaranteed. Please be familiar with the additional information on the Healthy Clemson website, such as the use of wipes for in-person classes. If an instructor does not have a face covering or refuses to wear an approved face covering without valid accommodation, students should notify the department chair. If a student does not have a face covering or refuses to wear an approved face covering without valid accommodation, the instructor will ask the student to leave the academic space and may report the student's actions to the Office of Community & Ethical Standards as a violation of the Student Code of Conduct. If the student's actions disrupt the class to the extent that an immediate response is needed, the instructor may call the Clemson University Police Department at 656-2222.
8. Specific COVID-19 related information for student absences:
For a student who reports testing positive or is being asked to quarantine because of exposure to the virus, it will be up to the student to inform the instructor that they will be moving to online only instruction for at least the next two weeks. Students are directed to use the Notification of Absence form in Canvas to initiate this notification, which can be found under the "Help" button on the left navigation. (For courses where Canvas is not used, the direct link to the Notification of Absence form can be found through the Division of Student Affairs site.) Additional communication via email is encouraged; students should follow up with their instructor to develop a continued plan of study for each course. Students cannot be penalized in their grade for needing to move to online instruction.
9. Please note that the University may convert to a purely online mode at any time during the semester.

ACCESSIBILITY STATEMENT: Clemson University values the diversity of our student body as a strength and a critical component of our dynamic community. Students with disabilities or temporary injuries/conditions may require accommodations due to barriers in the structure of facilities, course design, technology used for curricular purposes, or other campus resources. Students who experience a barrier to full access to a class should let the instructor know and make an appointment to meet with a staff member in Student Accessibility Services as soon as possible. You can make an appointment by calling 864-656-6848 or by emailing studentaccess@lists.clemson.edu. Students who receive Academic Access Letters are strongly encouraged to request, obtain, and present these to their instructors as early in the semester as possible so that accommodations can be made in a timely manner. It is the student's responsibility to follow this process each semester. You can access further information here: <http://www.clemson.edu/campus-life/campus-services/sds/>.

TITLE IX STATEMENT: Clem[son University is committed to a policy of equal opportunity for all persons and does not discriminate on the basis of race, color, religion, sex, sexual orientation, gender,

pregnancy, national origin, age, disability, veteran's status, genetic information or protected activity in employment, educational programs and activities, admissions and financial aid. This includes a prohibition against sexual harassment and sexual violence as mandated by Title IX of the Education Amendments of 1972. The University is committed to combatting sexual harassment and sexual violence. As a result, you should know that University faculty and staff members who work directly with students are required to report any instances of sexual harassment and sexual violence, to the University's Title IX Coordinator. What this means is that as your professor, I am required to report any incidents of sexual harassment, sexual violence or misconduct, stalking, domestic and/or relationship violence that are directly reported to me, or of which I am somehow made aware. There are two important exceptions to this requirement about which you should be aware:

Confidential Resources and facilitators of sexual awareness programs such as "Take Back the Night and Aspire to be Well" when acting in those capacities, are not required to report incidents of sexual discrimination.

Another important exception to the reporting requirement exists for academic work. Disclosures about sexual harassment, sexual violence, stalking, domestic and/or relationship violence that are shared as part of an academic project, a research project, classroom discussion, or course assignment, are not required to be disclosed to the University's Title IX Coordinator.

This policy is located at <http://www.clemson.edu/campus-life/campus-services/access/title-ix/>. Ms. Alesia Smith is the Executive Director for Equity Compliance and the Title IX Coordinator. Her office is located at 223 Holtzendorff Hall, phone number is 864.656.3181, and email address is alesias@clemson.edu.

SAFE CAMPUS: Clemson University is committed to providing a safe campus environment for students, faculty, staff, and visitors. As members of the community, we encourage you to take the following actions to be better prepared in case of an emergency:

- a. Ensure you are signed up for emergency alerts (<https://www.getrave.com/login/clemson>)
- b. Download the Rave Guardian app to your phone (<https://www.clemson.edu/cusafety/cupd/rave-guardian/>)
- c. Learn what you can do to prepare yourself in the event of an active threat (<http://www.clemson.edu/cusafety/EmergencyManagement/>)

ACADEMIC INTEGRITY: As members of the Clemson University community, we have inherited Thomas Green Clemson's vision of this institution as a 'high seminary of learning.' Fundamental to this vision is a mutual commitment to truthfulness, honor, and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a Clemson degree. Therefore, we shall not tolerate lying, cheating, or stealing in any form. In instances where academic standards may have been compromised, Clemson University has a responsibility to respond appropriately to charges of violations of academic integrity. Further information on Academic Integrity can be found in the [Undergraduate Announcements](#) and in the [Graduate School Policy Handbook](#).

COPYRIGHT STATEMENT: Materials in this course are copyrighted. They are intended for use only by students registered and enrolled in this course and only for instructional activities associated with and for the duration of the course. They may not be retained in another medium or disseminated further. They are provided in compliance with the provisions of the Teach Act. Students should be reminded to refer to the Use of Copyrighted Materials and "Fair Use Guidelines" policy in on the Clemson University website for additional information: <https://clemson.libguides.com/copyright>.

MODIFICATION STATEMENT: The instructor reserves the right to modify any aspect of the syllabus at any time during the semester for reasons including but not limited to COVID-related situations.

Syllabus version: January 5, 2021