

ECE 645 (MWF 4:30-5:20, PRCE 277)  
Detection and Estimation Theory  
Spring 2021 (January 17, 2021)  
General Information

Prerequisites: ECE 600 (Random Variables and Signals).

Staff:

job	name	office	phone	login
lecturer	James V. Krogmeier	MSEE 274	765-494-3530	jvk@purdue.edu

Office Hours for J. V. Krogmeier: Just stop by or send email for appointment

Text: None required. Good references include

1. H. V. Poor, *An Introduction to Signal Detection and Estimation, Second Edition*, Springer-Verlag, 1994.
2. S. M. Kay, *Fundamentals of Statistical Signal Processing: Estimation Theory*, Prentice-Hall, 1993.
3. S. M. Kay, *Fundamentals of Statistical Signal Processing: Detection Theory*, Prentice-Hall, 1998.
4. B. C. Levy, *Principles of Signal Detection and Parameter Estimation*, Springer, 2008.
5. H. L. Van Trees, *Detection, Estimation, and Modulation Theory: Part 1*, Wiley, 2001.
6. H. W. Sorenson, *Parameter Estimation: Principles and Problems*, Dekker, 1980.
7. L. L. Scharf, *Statistical Signal Processing: Detection, Estimation, and Time Series Analysis*, Addison-Wesley, 1991.
8. B. D. O. Anderson and J. B. Moore, *Optimal Filtering*, Dover, 2005.
9. M. D. Srinath, P. K. Rajasekaran and R. Viswanathan, *Introduction to Statistical Signal Processing with Applications*, Prentice-Hall, 1996.

My notes most closely follow Poor, Van Trees, Anderson and Moore.

Web site: [https://engineering.purdue.edu/~jvk/645/645\\_spring21.html](https://engineering.purdue.edu/~jvk/645/645_spring21.html)

Homework: – Every 2-3 weeks depending on lecture progress.  
– Turned in by 7:00 p.m. eastern time on the date due (scan to pdf and send via email to me).  
– Questions posted on the web.  
– Solutions posted on the web.  
– Grading: Problems will be checked off as having been attempted.  
– You may consult with others or references but turn in your own work, written or typed by your own hand.

Exams: – Two 24 hour take home exams that you schedule with me (tentative weeks):  
\* Some 24 hour period between 8 a.m. eastern on Monday, March 8, 2021 and 6 p.m. eastern on Friday, March 12, 2021.

- \* Some 24 hour period between 8 a.m. eastern on Monday, April 19, 2021 and 6 p.m. eastern on Friday, April 23, 2021.

These exams are not intended to take 24 hours – more like 4-6 hours although they might involve some computations. There is no final exam.

- Project:
- The projects are individual work intended to give you an opportunity to develop a deeper knowledge of some aspect of statistical signal processing of interest to you.
  - Examples:
    1. Read a paper important to you and reproduce statistical results from the paper with some computation or other extension.
    2. Read a section of statistical signal processing text that is not covered in our course and produce a lecture for it along with some example or computation to extend the material.
    3. ??
  - The grading of the project will be based on a written proposal (20%), a final report (40%), and a presentation video that will be played in class (40%). Due dates are TBD.

Grades: The final grade is computed as (I do not use  $\pm$  letter grades):

$$\text{final grade} = .10 * \text{homework} + .25 * \{\text{sum of take home exams}\} + .40 * \{\text{individual project}\}.$$

Notice: In the event of a major campus emergency, course requirements, deadlines and grading procedures are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor's control. In such an event information will be made available via the course web page and email.

Cheating: The School is very concerned about cheating. The following is from a January 1999 School statement on academic dishonesty:

The Purdue community expects every member of the 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, examinations, or labs will be considered cheating and will not be tolerated.

**Homework:** The only requirement is that whatever you turn in is something that you wrote up (by hand or by computer) yourself. Working in groups is fine. There are lots of solutions around. However, if you can't work these problems by yourself then you will find that the exams are very hard. Furthermore, the only way to make sure that you can work them by yourself is to actually work them by yourself. This is a variation on the adage: "no pain, no gain"! If you have questions please ask.

**Exams:** The list of things not to do includes, but is not limited to:

1. Share results or other information during an exam.
2. Bring forbidden notes or devices to an exam.
3. Work on an exam before or after the official time.
4. Share questions, results, answers, or other information with someone who has not yet taken the exam.
5. Request a regrade of work that has been altered.

If you have questions please ask.

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.

**Covid:** Students are expected to attend all classes in-person unless they are ill or otherwise unable to attend class. If they feel ill, have any symptoms associated with COVID-19, or suspect they have been exposed to the virus, students should stay home and contact the Protect Purdue Health Center (496-INFO).

In the current context of COVID-19, in-person attendance cannot be a factor in the final grades. However, timely completion of alternative assessments can certainly be part of the final grade. Students need to inform the instructor of any conflict that can be anticipated and will affect the timely submission of an assignment or the ability to take an exam.

Only the instructor can excuse a student from a course requirement or responsibility. When conflicts can be anticipated, such as for many University-sponsored activities and religious observations, the student should inform the instructor of the situation as far in advance as possible. For unanticipated or emergency conflicts, when advance notification to an instructor is not possible, the student should contact the instructor/instructional team as soon as possible by email or by phone. In cases of bereavement, quarantine, or isolation, the student or the student's representative should contact the Office of the Dean of Students via email or phone at 765-494-1747.

**Q'tine:** If you must quarantine or isolate at any point in time during the semester, please reach out to me via email so that we can communicate about how you can continue to learn remotely. Work with the Protect Purdue Health Center (PPHC) to get documentation and support, including access to an Academic Case Manager who can provide you with general guidelines/resources around communicating with your instructors, be available for academic support, and offer suggestions for how to be successful when learning remotely. Your Academic Case Manager can be reached at [acmq@purdue.edu](mailto:acmq@purdue.edu). Importantly, if you find yourself too sick to progress in the course, notify your academic case manager and notify me via email. We will make arrangements based on your particular situation.

**PPP:** The Protect Purdue Plan, which includes the Protect Purdue Pledge, is campus policy and as such all members of the Purdue community must comply with the required health and safety guidelines. Required behaviors in this class include: staying home and contacting the Protect Purdue Health Center (496-INFO) if you feel ill or know you have been exposed to the virus, properly wearing a mask in classrooms and campus building, at all times (e.g., mask covers nose and mouth, no eating/drinking in the classroom), disinfecting desk/workspace before and after use, maintaining appropriate social distancing with peers and instructors (including when entering/exiting classrooms), refraining from moving furniture, avoiding shared use of personal items, maintaining robust hygiene (e.g., handwashing, disposal of tissues) prior to, during and after class, and following all safety directions from the instructor.

Students who are not engaging in these behaviors (e.g., wearing a mask) will be offered the opportunity to comply. If non-compliance continues, possible results include instructors asking the student to leave class and instructors dismissing the whole class. Students who do

not comply with the required health behaviors are violating the University Code of Conduct and will be reported to the Dean of Students Office with sanctions ranging from educational requirements to dismissal from the university.

Any student who has substantial reason to believe that another person in a campus room (e.g., classroom) is threatening the safety of others by not complying (e.g., not properly wearing a mask) may leave the room without consequence. The student is encouraged to report the behavior to and discuss the next steps with their instructor. Students also have the option of reporting the behavior to the Office of the Student Rights and Responsibilities. See also Purdue University Bill of Student Rights.