OPTI 508 Syllabus

Updated 1/26/2021

Course Number and Title

OPTI 508 (all sections) – Probability and Statistics in Optics

Course Description

Optics 508 is a core course in probability and statistics with emphasis on optics applications. This course will cover many fundamental concepts such as random variables, stochastic processes and statistical inference. As you will see, statistics is used throughout optics and knowledge of statistics and probability is a valuable tool for most research applications. At times, however, this course will seem more like a statistics course than an optics course.

Instructor Information

Matthew A. Kupinski, Professor, Wyant College of Optical Sciences, Program in Applied Mathematics, and Department of Medical Imaging. Office hour to be announced on the course D2L website. Instructor offers two one-hour office hour sessions per week and is available upon request if extra help is needed. Office is room 435 in the west wing of the Meinel building. My office phone is 520.621.2967 and email is mkupinski@optics.arizona.edu .

Learning Outcomes

- Axioms of probability
- Definitions of probability
- Descriptions of random variables
- Characteristic functions
- Central limit theorem
- Transformations of random variables
- Speckle statistics
- Poisson counting statistics
- Stochastic processes
- Atmospheric turbulence models
- Statistical estimation theory
- Nonparametric density estimation
- Hypothesis testing
- Regression analysis

Required Texts and Materials

"Probability, Statistical Optics, and Data Testing," B. R. Frieden, 3rd edition, Springer, 2001. We cover chapters 2 through 15.

Schedule of Topics and Activities

This course will be lecture style with two lectures per week. In addition, students will be assigned approximately one homework assignment per week.

Assessments

Assessment Categories	Percentage of final grade
Homework (approximately 1 HW per week)	30%
Midterm Exam (Typically before Spring Break)	30%
Final Exam (Standard Exam Determined by University)	30%
Final Project (Due last day of classes)	10%
Total	**100%**

Grading Scale and Policies

Grades are based on whether the student's work demonstrates an understanding of the material:

100 – perfect understanding. No mistakes.

85 – some minor mistakes but generally demonstrated understanding of material.

70 – some conceptual problems.

60 – serious conceptual problems

Below 60 – No demonstrated understanding of the material

Assignments can generally be completed using pencil/pen and paper. Scanned assignments should be uploaded to the d2l website. Late assignments will be penalized 10 points (1 grade)for each week late.

University Policies

All university policies related to a syllabus are available at: https://academicaffairs.arizona.edu/syllabus-policies. By placing this link in your syllabus, you no longer need to have each individual policy includedin your syllabus.

Subject to Change Notice

Information contained in the course syllabus, other than the grade and absence policies, may be subjectto change with reasonable advance notice, as deemed appropriate by the instructor of this course.

Graduate Student Resources (optional)

Please consider including a link to the University of Arizona's Basic Needs Resources page: http://basicneeds.arizona.edu/index.html