

# IENG 213: Probability and Statistics

Course: IENG 213: Probability and Statistics

Semester: Spring '15

Number of credit hours: 3

## Description of the Course

Engineering Statistics. 3 Hr. PR: MATH 156. The use of basic statistical analysis in engineering decision making, including common statistical distributions encountered in engineering, test of hypotheses, confidence intervals, and introduction to simple linear regression.

Prerequisites: Math 156 (you really need to know calculus)

## Course Instructor

Steven E. Guffey, PhD, Professor and IH Program Coordinator  
IMSE Department, Room 353C MRB

GTA

Xiaofei Shi  
xashi@mix.wvu.edu  
MRB Room 152

## Communications with the Instructor

I will frequently email students and I will post many things to eCampus. It is your responsibility to read your email and to check eCampus frequently. I will generally email only to your Mix account, as is University policy. If you don't use mix, set up the mix account to forward emails sent to mix to your preferred address.

Email: [Steve.Guffey@mail.wvu.edu](mailto:Steve.Guffey@mail.wvu.edu) Note: do NOT use [seguffey@gmail.com](mailto:seguffey@gmail.com)

I will email assignments and handouts through the eCampus site or using your mix email addresses.

Phone: 304-685-1298 (cell phone) Do not call in the period from 9:00 to 2:15 on Tuesdays or Thursdays. Do not use my WVU 293 number.

Please send emails rather than leaving voice mail.

Call my cell phone number if I am not in my office during posted office hours or in the unlikely event that I fail to show up for an appointment with you. Usually I am nearby dealing with some problem or another and will show up in minutes but call me immediately if I am late to an appointment with you.

Office visits:

My office hours for IENG 213 are posted by my door.

Other times by appointment (email greatly preferred).

If you drop by without an appointment, I will see you if at all possible, but we are likely to be interrupted frequently and I will answer my phone if it rings since I probably have asked for someone to call me during that period of time.

# IENG 213: Probability and Statistics

## Textbook for the course

It is very helpful to read the chapters in the book and to review the Powerpoint files before each class.

**Title:** Probability and Statistics for Engineers and Scientists, 8<sup>th</sup> Edition

**Authors:** Ronald E. Walpole  
Raymond H. Myers  
Sharon L. Myers  
Keying Yee

## Grading Elements and Weighting

• Tests (2), each counting 30%	60%
• Final (only partially cumulative)	30%
• Homework and Quizzes HW due next class unless specified otherwise	13%**
Missed or late HW and missed quizzes can be “made up” by taking a quiz prior to the next scheduled class. Schedule these makeup quizzes with the GTA.	
HW solutions will be posted on my door.	
Total	103%

\*\*Basically, you can get up to 3 points of extra credit if you make 100% on all HW

## Course Contribution to Professional Component

Engineering Science – 100%, Engineering Design – 0%

## Course Relationship to Undergraduate IE Educational Outcomes:

Outcome 1: Ability to use modern IE methods (i.e., statistics)

Key abilities -- Students will learn the bases of and the application of:

1. Random variables and probability distributions
2. Mathematical expectations
3. Confidence intervals
4. Hypothesis testing

Outcome 2: Ability to apply knowledge of math (i.e., calculus)

Key abilities -- Students will use calculus to computed expected values

Outcome 3: Ability to .... analyze and interpret data

Key abilities

1. Students will be able to compute summary statistics from experimental data
2. Student will be able to state null and alternate hypotheses for hypothetical experiments

# IENG 213: Probability and Statistics

## Method of Instruction

IENG 213 includes 3 hours of lectures each week of the semester, except for class times set aside for exams, pop tests, and review of homework.

## Approximate Topical Schedule

Lecture Topic or Exam	Chap
Introduction to Statistics and Data Analysis	1
Probability	2
Random Variables and Probability Distributions	3
Mathematical Expectation	4
First Exam	
Some Discrete Probability Distributions	5
Some Continuous Probability Distributions	6
Fundamental Sampling Distributions and Data Descriptions	8
Second Exam	
One and Two Sample Estimation Problems	9
One and Two Sample Tests of Hypothesis	10
Review and course evaluation	
Third ("final") Exam (NOT cumulative per se)	

## Pop Quizzes:

If you miss class for any reason or are too late to take the quiz, you get a zero on that day's pop quiz. You can "makeup" a missed pop quiz by taking a substitute quiz prior to the next class. Contact the GTA to arrange such a pop quiz.

## Homework:

Assignments are listed on the Powerpoint file for each chapter. When we get to a slide that lists a homework assignment, that HW is assigned and will be due the next class. HW that is late no more than two class periods can be made up prior to the following class by taking an extra pop quiz scheduled with the GTA. The GTA will select from one of the HW problems in question and make it the entire pop quiz.

A correct answer to a multiple step problem will be given a zero if you do not show the work.

Identify your HW or Quiz when you turn it in. On the cover or first page, put:

- Your name and folder number
- Chapter of assignment
- Section of the assignment (i.e., A, B, C, D, E)

Put your initials or name on all subsequent pages

# IENG 213: Probability and Statistics

## Tests

Three major tests are given. They are not cumulative per se, but the knowledge you need to work later problems depends to some degree on what you have learned in previous sections.

Rules for receiving credit for responses on tests and exams:

- You must show work if more than one step is involved, whether the question explicitly asks you to show work or not. A solution of a multiple step problem that does not show the work correctly will be given a zero even if the final answer happens to be correct.
- If the test asks your opinion, you must back up your opinion with statistical or logical proof. “Yes or no” answers without a correct explanation and proof generally will be given a zero.
- An answer that is difficult to follow because it is messy, disorganized, or otherwise poorly presented will be given zero credit.
- Presentations of two solutions for the same problem will be given no credit unless one solution is marked through clearly and unambiguously.

## Statement on Makeup Exams

There will be two types of makeup exams:

1. Makeup exam given within 3-4 school days to students who miss a scheduled exam due to:

severe, incapacitating medical problems (e.g., being hospitalized on the day of the exam),

being out of town on the day of the exam due to a death in the immediate family (mother, father, sister, brother, grandmother, grandfather),

attendance at a WVU sponsored event that you are required to attend (e.g., away soccer game if you are on the team; attendance at a professional conference that your department requires you to attend). If you will miss the exam due to a university official event, you must bring me a letter from the coach or faculty member who requires your attendance before the day of the exam. Even if you notify me in person you must also notify me by email and obtain a response from me (for my records).

In all of those cases above, you must notify me by email or in person PRIOR to the time of the scheduled exam. If I do not find your justification highly compelling, you must employ the second option (below).

2. Makeup exam during the scheduled final exam during finals week: This exam will cover all topics and problems from the exam you missed. This exam can be taken by anyone who missed a regular exam or exams and did not qualify for or could not make it for any reason to the makeup exam given after a regularly scheduled test. You cannot take more than one such makeup exam except for what I accept as truly extraordinary and meritorious reasons.

You may NOT repeat an exam you have already taken.

There will be no extra credit assignments under any circumstances.

If you have not taken an exam by the time mid-term grades are due, I will list an F for your midterm grade. If by the end of the course you have not taken an exam or its makeup, you will be given a zero for that portion of your grade. To receive an incomplete, you must first request an incomplete and obtain my agreement and the concurrence of the IMSE Chair and the CEMR Associate Dean.

# IENG 213: Probability and Statistics

## Rules to avoid the appearance of cheating on tests and exams:

1. During the test, the only things on your desk or within your reach or sight should be the test, authorized “cheat sheets” posted on my web site, a few sheets of blank paper, your calculator, and the statistical tables needed for the test. All other devices and materials are forbidden and will be considered a violation of class rules and as direct evidence of cheating or having prepared to cheat. That includes electronic devices other than a single calculator.
  - a. An exception will be made for materials and devices left in closed backpacks, purses, and other closed carrying devices that substantially impede surreptitious access to their contents.
  - b. No such carrying devices should be on any desk or left open for any reason. If you do not have a backpack or other suitable carrying device, you may bring unauthorized devices or materials to me at the front of the room before beginning to receiving the test.
  - c. If you need access to the contents of a purse or backpack (etc.), raise your hand and obtain permission of the instructor before accessing the contents.
2. Placing any forbidden materials or devices on or near your desk in a manner allowing access to them will be considered direct evidence of cheating. For example, placing problem solutions on the floor or any other nearby surface will be considered cheating whether you refer to them during the test or not.
3. For the cheat sheets and the statistical tables, you may make (handwritten) notes on the printed side, but not the reverse side. Violating this rule will be considered direct evidence of cheating. Likewise, you may not bring extra tables or cheat sheet pages to the exams..
4. You may use either statistical tables copied from the text or the tables I have posted to my website but not both. You may not use a book or other reference that has the tables in it during the test.
5. You may not communicate with anyone during a test or quiz other than the instructor or TA. Verbal, written, or electronic communications during a test of any kind will be considered direct evidence of cheating regardless of the subject or content of the communication. Turn off cell phones. If you forget and it rings, turn it off immediately. Do not bring it to your ear. Do not wear any kind of headphone, earbud, or blue tooth device.

## Comment on the class

Engineering statistics is taught in virtually all engineering schools. It is required for a very good reason: interpreting statistic data is crucial to correct decision-making in a world filled with ever more uncertainty and change.

We must deliver more and more value to earn our pay, especially if we want highly paid positions. However, we can work only so many hours; the key to competitiveness is intellectual skills. The statistics classes you take here give you an extremely important skill that is increasingly central to making optimal decision. Statistical knowledge and skills can give you a crucial advantage over engineers who either did not take statistics or forgot it as quickly as possible.

The IMSE faculty is acutely aware of all this. That is why this course is considered to be one of the most important you will take. However, this course is easy for a few students, a lot of work for most, and a struggle for a substantial minority.

Every topic covered in the class is there because of either accreditation requirements or to prepare you for a later course. The topics are the same as those covered in other engineering statistics courses across the country.

I am acutely aware of the importance of this course to your success. For that reason, I cover everything you must learn as thoroughly as time permits. For that reason I also give more homework than 85% of courses. There is no adequate or reliable substitute for doing homework.

# IENG 213: Probability and Statistics

## Statement on Attendance

I do not take attendance. It takes up far too much class time. My experience is that failing to attend class is generally followed by doing poorly in the class. It is not impossible to do well while doing poorly on homework or failing to attend class, but the odds are against you.

## Statement on Cancelling Class

If the University cancels classes, then ours will not meet, either. Otherwise, I am extremely reluctant to cancel classes and have never done so in nearly 30 years as an academic. We have so much to cover that we cannot afford to reduce the number of classes we hold.

If I am ill and cannot attend, I will request that another faculty member teach the class for me.

Please do not call me or email to ask if I intend to cancel. Unless the University has cancelled all classes, we will meet. Do not contact me to say you will miss class unless an exam is scheduled for that day.

## Academic Dishonesty

*Acts of academic dishonesty, such as cheating or plagiarism or assisting others in cheating, may result in a failing grade (F) and will be reported to the department Chair.*

## Statement on Social Justice

*West Virginia University is committed to social justice. I concur with that commitment and expect to foster a nurturing learning environment based upon open communication, mutual respect, and non-discrimination. Our University does not discriminate on the basis of race, sex, age, disability, veteran status, religion, sexual orientation, color or national origin. Any suggestions as to how to further such a positive and open environment in this class will be appreciated and given serious consideration.*

## Statement on Disability Accommodation

*If you are a person with a disability and anticipate needing any type of accommodation in order to participate in this class, please advise me and make appropriate arrangements with Disability Services (304-293-6700).*

Assuming no background in probability and statistics, *Statistics and Probability with Applications for Engineers and Scientists* features a unique, yet tried-and-true, approach that is ideal for all undergraduate students as well as statistical practitioners who analyze and illustrate real-world data in engineering and the natural sciences. BHISHAM C. GUPTA, PhD, is Professor in the Department of Mathematics and Statistics at the University of Southern Maine. Dr. Gupta has written four books and more than thirty articles. IRWIN GUTTMAN, PhD, is Professor Emeritus of Statistics in the Department of Mathematics at the State University of New York at Buffalo and Department of Statistics at the University of Toronto, Canada. *Introduction to Probability and Statistics for Engineers and Scientists, Fifth Edition* is a proven text reference that provides a superior introduction to applied probability and statistics for engineering or science majors. The book lays emphasis in the manner in which probability yields insight into statistical problems, ultimately resulting in an intuitive understanding of the statistical procedures most often used by practicing engineers and scientists. This text is intended for upper level undergraduate and graduate students taking a course in probability and statistics for science or engineering, and for scientists, engineers, and other professionals seeking a reference of foundational content and application to these fields. Key Features. *Probability & statistics for engineers & scientists*/Ronald E. Walpole . . . [et al.] 9th ed. p. cm. ISBN 978-0-321-62911-1 1. Engineering—Statistical methods. 2. Probabilities. I. Walpole, Ronald E. As in previous editions, a large number of exercises that deal with real-life scientific and engineering applications are available to challenge the student. The many data sets associated with the exercises are available for download from the website <http://www.pearsonhighered.com/datasets>. xv.