Worcester Polytechnic Institute

MA 511 Applied Statistics for Engineers
Mathematics Department
Summer Term 2024

Professor
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Textbooks (all available online and free/open source):
Required:
Applied Statistics for Engineers and Scientists (2014); Petruccelli, Nandram, and Chen
ISBN 0-13-565953-1 (*Electronic link to free book available on Canvas*)
Optional:
Online Statistics Education: A Multimedia Course of Study (http://onlinestatbook.com/).
Project Leader: David M. Lane, Rice University.

Course Description: Topics covered include descriptive statistics, design of studies and collection of data, basics of probability, confidence intervals and hypothesis testing for means and proportions from one and two samples, simple and multiple regression, analysis of one and two-way tables and one-way analysis of variance. As time permits, additional topics, such as distribution-free methods and the design and analysis of factorial studies will be considered.

Prerequisite Courses: There is no presumption of statistical knowledge prior to the class. Material covered is similar to WPI's undergraduate Applied Statistics I & II (MA 2611 and MA 2612) with additional depth in topics such as probability mass and density functions, logic and tradeoffs of Type I and II errors, and calculation of Type II error. Some basic differential and integral calculus may be applied.

Learning Outcomes:
- Reason causation from association and efficiently critique and design studies given sampling constraints and the inference goal.
- Interpret the context of evidence drawn from random sample statistics and their inference about population parameters.
- Select and use confidence intervals and hypothesis tests for mean and proportion in one and two population cases. Distinguish trade-offs for types of errors made in statistics and weigh their potential consequences when conclusions are made.
- Construct linear regression models for multivariate data analysis. Propose causal links and choose variable forms that fit hypotheses and use software to formulate regression equations and graphs. Interpret the strength of relationships with statistics and observable output.
- Recognize the assumption of normality is not appropriate to all studies and make use of alternative nonparametric tests when required.

Communication:

I will also be accessible through Zoom for online office hours. Link will be provided on Canvas. MR 6:30-7:30pm or by appointment. I will also correspond by e-mail daily and check discussion boards on Canvas.

Course Approach:

- 10-week online course (May 20nd -July 27th).
- Asynchronous video presentations (five to twenty minutes) are used. No class lectures.
- Live office hours on Mondays on 6:30-7:30pm and **also by appointment.**
- View Announcements, Discussions, Modules (PDF Notes, Videos and Solutions), and Assignments on canvas.wpi.edu.

Course Requirements:

1. **Grade Determination Breakdown**

   A 90-100, B, C, D, and F.

   A score greater than 80 earns at least a B but scaling can occur depending on the difficulty of exams. A grade of C will scale no lower than a 65 and D no lower than 50.

   If you experience illness or conflicts inform me early so we can discuss alternative plans.

   Two Exams 70%   30-40% Test 1: Date R, 6/20 6:30-8:30pm Chapters 1-5

   30-40% Test 2: Date R, 7/27 6:30-8:30pm Chapters 6-9, 11

   o Exam proctoring done through Zoom. I will be proctoring on exam night.

   o Working camera/audio required throughout the exam. You should post your completed exam as one pdf file.

   o Low exam grade is worth 30%, while the high exam is worth 40%.

   Homework Problem Sets

   30% T 5/28, T, 6/4, T, 6/11, T, 6/18; T, 7/2, T, 7/9, T, 7/16, T, 7/23

2. **Assignments**

   Submit assignments by 11:00pm on the due date via electronic submission on Canvas. Corrections are published after the due date and graded within one week.

   o Your work does not need to be typed. Your homework should show 1) Complete Steps, be in 2) Proper Order and requires 3) Neat Work.

   o Work in Excel (or other software) should be copied and pasted into Word document with appropriate text (typed or written) supporting your work. Copy tables, graphs, and key output but not all the raw data in the sheet. Final work in a single pdf file. Upload your final file in Canvas under the Assignments menu item.

3. **Late Work Policy**
   I accept late work, but it is subject to point deduction. I must receive the completed assignment before solutions are posted for the assignment. Please start assignments early and communicate with me to discuss questions. Feel free to talk with me if you are encountering difficult circumstances.

4. **Class Participation Expectations and Criteria**
   A discussion board is used in Canvas to facilitate conversation and ideas. Assignments may tie into the discussion board for brainstorming with fellow students.

Technical Requirements: Go through WPI VPN GlobalProtect through https://hub.wpi.edu/software/570/globalprotect . Login is required.

After logging into the GlobalProtect VPN, access the WPI terminal applications through "Remote Desktop Connection". Search on your computer: "Remote Desktop Connection" -> Type in windows.wpi.edu -> Full login@wpi.edu and Password

Excel: Use "Analysis Toolpack": File->Options->Add-Ins->Analysis Toolpack->Go.

Other Software: We make additional use of programs such as Matlab and SPSS.
You can find Matlab, SPSS, and other options through Remote Desktop Connection.
For your own personal computer make use of WPI downloads: https://its.wpi.edu/All-Software
       If you want to use a different software program for the course provide proper documentation on assignments and grading can be adapted to your program of choice. I am flexible to your program of preference.

Library Access:
As a student at WPI, you have access to a variety of resources through the library. Use the link here to access databases, e-journals, and/or e-books. You will be required to log in with your WPI username and password to access materials.

POLICIES

Academic Integrity:
See school's policy: *www.wpi.edu/offices/policies/honesty/studentguide.html*
Working together is permissible except during exams. When working together you must show individual thought and writing in each problem assigned. Direct copying (and allowing someone to copy directly from you) is not acceptable.

Consequences for violating the Academic Honesty Policy range from earning a zero on the assignment, failing the course, or being suspended or expulsion from WPI.
The Dean of Students Office maintains judicial records for any act of academic dishonesty.

Common examples of violations include:
- Copying and pasting text directly from a source without appropriate citation.
- Paraphrasing or rephrasing from a source without providing appropriate citations.
- Turning in work where a good portion of it is the same as another student.

Academic Accommodations:
We strive to create an inclusive environment where all students are valued members of the class community. If you need course adaptations or accommodation, or if you have medical needs that may impact your performance or participation in this course, please make an appointment with us as soon as possible. If you have approved accommodations, please request your accommodation letters online through the Office of Accessibility Services student portal. If you have not already done so, students who need to utilize accommodation for this course are encouraged to contact the Office of Accessibility Services as soon as possible to ensure that such accommodations are implemented in a timely fashion.
Email – AccessabilityServices@wpi.edu
Phone – (508) 831-4908
On Campus – Unity Hall

Please know it is important to me that you feel you are in the best position to succeed in the course. If you need accommodation and there is anything I can do to help, I will be happy to assist to the best of my ability.

Mental Health:
WPI's Student Development & Counseling Center (SDCC) staff are available for students in need of support: contact them directly and confidentially by phone at 508-831-5540 or email at SDCC@wpi.edu; or stop by their office at 16 Einhorn Road.

The I'm Concerned About a Student form provides a venue to connect with WPI services if you know of a student who is struggling and needs outreach.

The **National Suicide Prevention Lifeline is a free, 24/7** service that can provide individuals with support, information, and local resources regarding suicide. **Call them at 1-800-273-TALK (8255) or visit www.suicidepreventionlifeline.org.** There is also Suicide Awareness & Prevention information on the WPI website.

If there is a chance someone is in imminent danger of suicidal action, WPI Campus Police can be reached at 508-831-5555 (or call 911 if off campus).

Expectations and Behavior:
Reasons for missing exams or assignments should be <u>discussed beforehand</u> with the professor or TA/PLA/GLA. Let me know of personal or academic difficulties you are experiencing.

Course Schedule:
Week 1: May 20-24 Chapter 1-2.
Week 2: HW #1 due T, 5/28 (by 11pm). Chapter 2-4.
Week 3: HW #2 due T, 6/4. Chapter 3-4.
Week 4: HW #3 due T, 6/11. Chapter 5.
Week 5: HW #4 due, T, 6/18. Review and **Test #1 R, 6/20 6-8pm (Chapter 1-5)**
Week 6: Chapter 6.1-6.3, 6.7-6.10 and 7.4.
Week 7: HW #5, T, 7/2. Chapter 6.5, 6.11, 7.2-7.3, 7.5.
Week 8: HW #6 due, T, 7/9. Chapter 8.2, 8.4, 8.9-8.10.
Week 9: HW #7 due, T, 7/16. Chapter 9.1-9.3, 11.3, 11.5, 11.7
Week 10: HW #8 due T, 7/23. Review and **Test #2 R, 7/25 6-8pm**