Syllabus: APSC3115.80 and EMSE 6115.80

Course and Contact Information:
Course: APSC 3115.80 –Engineering Analysis III, cross listed with
Course: EMSE 6115.80 – Uncertainty Analysis for Engineers
Semester: **Summer 2025** # of Credit Hours: 3.0
Meeting Time: Tuesday 3:30PM to 6:00PM, Thursday 3:30 to 6:00pm
Location: Tompkins 405

Instructor:
Name: J. René van Dorp, Professor
Campus Address: 800 22nd Street, Office 2800, Washington DC 20052
Phone: 202-994-6638
E-mail: dorpjr@gmail.com
Office hours: Wednesday 2:00PM to 4:00PM

Course Description:
This course covers the basics of probability theory and statistics and ventures into some topics that go beyond an introductory course such as: the law of large numbers, unbiased estimation, the central limit theorem, Type I and Type II errors.

Total of 112.5 Student Engagement Hours are divided over: 2.5 hours of class instruction + midterm exam and a final exam over 15 weeks. Completion of homework and of the reading assignments is expected at a minimum of 4 hours per Session over 13 Sessions of class preparation. Studying/preparing for the midterm exam and final exam is expected in addition at a minimum of 11.5 hours. **Minimum expected number of student engagement hours totals to 112.5.**

Prerequisite Requirement: A first course in calculus is needed as a prerequisite for this course as well as introductory proficiency with Micro Soft Excel. In addition to high-school algebra, some infinite series are used. Integration and differentiation are the most important skills, mainly in a single dimension.
MATH 1231. Single-Variable Calculus I. 3 Credits. Limits and continuity. Differentiation and integration of algebraic and trigonometric functions with applications. Prerequisite: the placement examination or a score of 720 or above on the SAT II in mathematics.
MATH 1232. Single-Variable Calculus II. 3 Credits. The calculus of exponential and logarithmic functions. L'Hopital's rule. Techniques of integration. Infinite series and Taylor series. Polar coordinates. Prerequisite: MATH 1221 or MATH 1231.

Required Lecture Notes: Electronic Lectures notes available at:
http://www2.seas.gwu.edu/~dorpjr/APSC3115/Intro6115.html

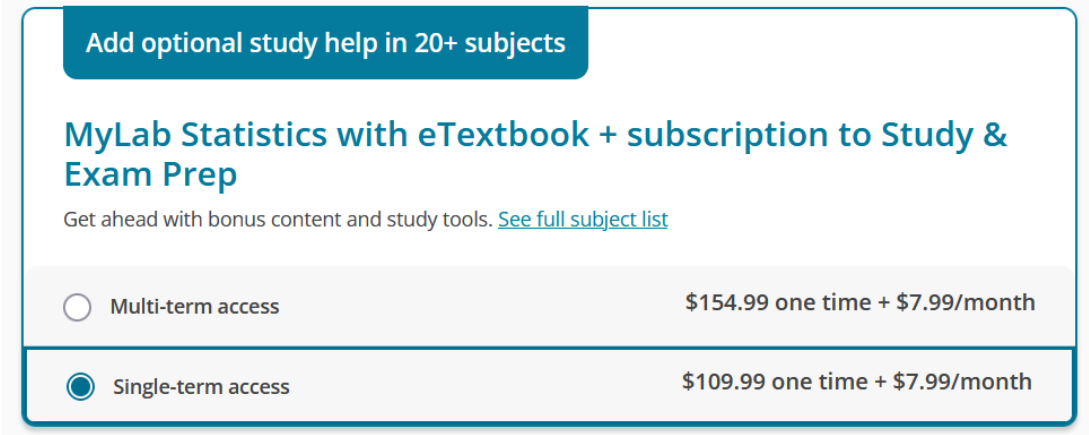
Required Software:
MS EXCEL – Available in Tompkins 405.
MINITAB – Available in Tompkins 405.

Required Text: Textbooks below are required. However, electronic lecture notes used throughout this course are developed from the first textbook. Homework is assigned from the online textbook. Reading accompanying chapter from both texts may further enhance understanding. E-versions of these textbooks are available for free from Springer-Link from GW computers.

1. "A Modern Introduction to Probability and Statistics, Understanding Why and How" by F.M. Dekking, C. Kraaikamp, H.P. Lopuhaä and L.E. Meester, Springer-Verlag, 2005.

Required online Textbook Subscription:

2. Probability and Statistics for Engineers and Scientists, 9th Edition, with MyLabs subscription, Walpole, Myers, Myers and Ye, Pearson Publishing, 2017. Registration instructions can be found here.



Optional Textbook:

3. "Modern Mathematical Statistics with Applications", by by Devore, Jay L., Berk, Kenneth N., 2nd ed. 2012.

Specific Goals for the Course:

This course is designed to develop students' basic probabilistic and statistical intuition. At the end of the course students will be able to do the following:

(i) Apply the laws of probability
(ii) Identify and apply various probability distributions,
(iii) Calculate basic statistical measures for probability distributions and their sample analogs,
(iv) Design and perform hypothesis tests and other evaluative tests,
(v) Analyze a problem in which you are able to apply at least 3 different topics from this class,
(vi) Learn a statistical software package.

Program Outcomes (check mark indicates that course contributes to the outcome)

√ (1) Ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
(2) Ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
(3) Ability to communicate effectively with a range of audiences
(4) Ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
(5) Ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
√ (6) Ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
(7) Ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Method of Instruction:

One hour and 20 minutes lecture including homework discussion, followed by a 10 minute break and a one hour lecture. Microsoft Excel and Minitab are used to perform statistical analysis during the class sessions and the homework. During class sessions the only software programs that should be open on your desktop are either Adobe Acrobat (for viewing the notes) or Microsoft Excel or MINITAB for statistical analysis. **During the class sessions (except for the break of course) a student is not to check his e-mail, the internet and should not engage in instant messaging sessions. Basically, your attention should be directed towards the class material.**

Homework Grading:
Homework will have to be completed as per the outline of the course. Homework sets are assigned in Pearson's Mylabs and are to be completed by the students online as per the schedule

Grading:
10% - Attendance
20% - Homework
30% - Midterm Exam
40% - Final Exam

Reading Assignments:
Lecture notes and recommended chapters for reading will be assigned prior to class as indicated in the outline.

Midterm Exam and Final Exam:
There will be one midterm and one final exam. In principle, **all exams are cumulative**, and cover all assigned reading, homework and class discussions. **Calculators are not allowed during the exams, you are required to use MS. Excel as your calculator**; Worked out homework solution in Ms. Excel and Minitab may **not** be used. Books and notes may also **not** be used, with the following exceptions:

- Midterm Exam: you may prepare and use up to **3** sheets of 8 ½ by 11 inch paper and use MS Excel for calculations and/or Minitab for statistical analysis;
- Final Exam: you may prepare and use up to **6** sheets of 8 ½ by 11 inch paper and use MS Excel and/or Minitab for statistical analysis.

You may record whatever you wish on these sheets, **except worked out solutions of the homework problems** and the sheets do not need to be hand-written. **No materials may be shared during the exams.**

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Class Schedule: Subject to change, please check the schedule regularly

Week	Session	Date	Day of Week	Chapters	Topics	Homework Assigned	Homework Due
1	1	20-May	Tuesday	1	Why Probability and Statistics?	Homework Set 0	
1	1	20-May	Tuesday	2, 3	Outcomes, events, probability and cond. prob.	Homework Set 1	
1	2	22-May	Thursday	4, 5	Discrete and continuous random variables		Homework Set 0
1	2	22-May	Thursday	6	Simulation		
2	3	27-May	Tuesday	7	Expectation and variance	Homework Set 2	Homework Set 1
2	3	27-May	Tuesday	8	Computations with random variables		
2	4	29-May	Thursday	9	Joint Distributions and Independence		
2	4	29-May	Thursday		Extra Notes on Sampling		
3	5	3-Jun	Tuesday	10	Covariance and correlation	Homework Set 3	Homework Set 2
3	5	3-Jun	Tuesday	11	More computations with more random variables		
3	6	5-Jun	Thursday	11	More computations with more random variables	Practice Exam (PE)	
3	6	5-Jun	Thursday	13	The law of large numbers		
4	7	10-Jun	Tuesday		Midterm Review		Homework Set 3
4	7	10-Jun	Tuesday	14	The Central Limit Theorem		PE - Not for Grade
4	8	12-Jun	Thursday		Midterm Exam: Chapters 1 - 11		
4	8	12-Jun	Thursday		Midterm Exam: Chapters 1 - 11		
5	9	17-Jun	Tuesday		Discuss Midterm Solution	Homework Set 4	
5	9	17-Jun	Tuesday	15, 16	Exploratory Data Analysis - Graphical, Numerical		
5	10	19-Jun	Thursday	19, 20	Unbiased estimators, Efficiency and MSE	Homework Set 5	Homework Set 4
5	10	19-Jun	Thursday				
6	11	24-Jun	Tuesday	23	Confidence intervals for the mean		
6	11	24-Jun	Tuesday	24	More on confidence intervals		
6	12	26-Jun	Thursday	25	Testing hypotheses: Essentials	Homework Set 6	Homework Set 5
6	12	26-Jun	Thursday	26	Testing hypotheses: Elaboration		
7	13	1-Jul	Tuesday	27	The t-Test		
7	13	1-Jul	Tuesday	28	Comparing Two Samples		
8	14	3-Jul	Thursday		Final Review		Homework Set 6
8	14	3-Jul	Thursday				
8	15	8-Jul	Tuesday		Final Exam: Chapters 13 - 16, 19 - 20, 23 - 28		
8	15	8-Jul	Tuesday		Final Exam: Chapters 13 - 16, 19 - 20, 23 - 28		

Use of Electronic Course Materials and Class Recordings

Students are encouraged to use electronic course materials, including recorded class sessions, for private personal use in connection with their academic program of study. Electronic course materials and recorded class sessions should not be shared or used for non-course related purposes unless express permission has been granted by the instructor. **Students who impermissibly share any electronic course materials are subject to discipline under the Student Code of Conduct.** Please contact the instructor if you have questions regarding what constitutes permissible or impermissible use of electronic course materials and/or recorded class sessions. Please contact Disability Support Services if you have questions or need assistance in accessing electronic course materials.

Academic Integrity Code

Academic Integrity is an integral part of the educational process, and GW takes these matters very seriously. Violations of academic integrity occur when students fail to cite research sources properly, engage in unauthorized collaboration, falsify data, and in other ways outlined in the Code of Academic Integrity. Students accused of academic integrity violations should contact the Office of Academic Integrity to learn more about their rights and options in the process. Outcomes can range from failure of assignment to expulsion from the University, including a transcript notation. The Office of Academic Integrity maintains a permanent record of the violation.

More information is available from the Office of Academic Integrity at studentconduct.gwu.edu/academic-integrity. The University's "Guide of Academic Integrity in Online Learning Environments" is available at studentconduct.gwu.edu/guide-academic-integrity-online-learning-environments. Contact information: rights@gwu.edu or 202-994-6757.

University policy on observance of religious holidays

In accordance with University policy, students should notify faculty during the first week of the semester of their intention to be absent from class on their day(s) of religious observance. For details and policy, see "Religious Holidays" at provost.gwu.edu/policies-procedures-and-guidelines

Support for students outside the classroom

Virtual academic support

A full range of academic support is offered virtually. See coronavirus.gwu.edu/top-faqs for updates.

Tutoring and course review sessions are offered through Academic Commons in an online format. See academiccommons.gwu.edu/tutoring

Writing and research consultations are available online. See academiccommons.gwu.edu/writing-research-help

Coaching, offered through the Office of Student Success, is available in a virtual format. See studentsuccess.gwu.edu/academic-program-support

Academic Commons offers several short videos addressing different virtual learning strategies for the unique circumstances of the fall 2020 semester. See academiccommons.gwu.edu/study-skills. They also offer a variety of live virtual workshops to equip students with the tools they need to succeed in a virtual environment. See tinyurl.com/gw-virtual-learning

Writing Center

GW's Writing Center cultivates confident writers in the University community by facilitating collaborative, critical, and inclusive conversations at all stages of the writing process. Working alongside peer mentors, writers develop strategies to write independently in academic and public settings. Appointments can be booked online. See gwu.mywconline.

Academic Commons

Academic Commons provides tutoring and other academic support resources to students in many courses. Students can schedule virtual one-on-one appointments or attend virtual drop-in sessions. Students may schedule an appointment, review the tutoring schedule, access other academic support resources, or obtain assistance at academiccommons.gwu.edu.

Disability Support Services (DSS) 202-994-8250

Any student who may need an accommodation based on the potential impact of a disability should contact Disability Support Services to establish eligibility and to coordinate reasonable accommodations. disabilitysupport.gwu.edu

Counseling and Psychological Services 202-994-5300

GW's Colonial Health Center offers counseling and psychological services, supporting mental health and personal development by collaborating directly with students to overcome challenges and difficulties that may interfere with academic, emotional, and personal success. healthcenter.gwu.edu/counseling-and-psychological-services

Safety and Security

- In an emergency: call GWPD 202-994-6111 or 911
- For situation-specific actions: review the Emergency Response Handbook at safety.gwu.edu/emergency-response-handbook
- In an active violence situation: Get Out, Hide Out, or Take Out. See go.gwu.edu/shooterpret
- Stay informed: safety.gwu.edu/stay-informed