Course and Contact Information:
Course: APSC 3115.80 – Engineering Analysis III, cross listed with Course: EMSE 6115.80 – Uncertainty Analysis for Engineers
Semester: Summer 2019    # of Credit Hours: 3.0
Meeting Time: Monday and Wednesday from 3:30PM to 6:00PM
Location: Tompkins Hall 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: Mondays and Wednesdays 1:00PM to 2:00PM

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, and the central limit theorem. Examples and datasets in this book are mostly from real-life situations. "Probability and statistics are fascinating subjects on the interface between mathematics and applied sciences that help us understand and solve practical problems. We believe that you, by learning how stochastic methods come about and why they work, will be able to understand the meaning of statistical statements as well as judge the quality of their content, when facing such problems on your own. Our philosophy is one of how and why: instead of just presenting stochastic methods as cookbook recipes, we prefer to explain the principles behind them." - Dekking et al. (2005)

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 Microsoft 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 Text: 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. Six months or twelve months rental of the MINITAB Software is available for students at a discounted rate at:
http://www.onthehub.com/minitab/

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 second 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.


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

Program Outcomes (check mark indicates that course contributes to the outcome)
√ (a) ability to apply knowledge of mathematics, science, and engineering
   (b) ability to design and conduct experiments, as well as to analyze and interpret data
   (c) ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
   (d) ability to function on multidisciplinary teams
   (e) ability to identify, formulate, and solve engineering problems
   (f) understanding of professional and ethical responsibility
   (g) ability to communicate effectively
   (h) broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
   (i) recognition of the need for, and an ability to engage in life-long learning
   (j) knowledge of contemporary issues
√ (k) ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

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. For each homework problem a student may be called upon to discuss their solution, so you must be prepared! The rest of the class should be involved in the discussion. Your level of effort will be graded. Not handing in a homework problem will result in 0 points. Homework problems that are handed in on time AND demonstrate an adequate level of effort will typically be awarded 1 point. Partial points can be awarded for homework assignments. At times a larger
homework problems may be awarded a number of effort points larger than 1, which will be indicated beforehand. Homework problems that are handed late within one day after the due date receive a maximum of 50% of the assigned homework credit. Homework that is handed more than one day late will not be awarded any credit.

**Grading:**
10% - Class Attendance
15% - Homework
35% - Midterm Exam (In-Class)
40% - Final Exam (In-Class)

**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 may be used during all exams; computers 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.
### Class Schedule: Subject to change, please check the schedule regularly

<table>
<thead>
<tr>
<th>Session</th>
<th>Week</th>
<th>Date</th>
<th>Day of Week</th>
<th>Chapters</th>
<th>Topics</th>
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<tr>
<td>1</td>
<td>1</td>
<td>19-May</td>
<td>Monday</td>
<td>1, 2</td>
<td>Why Probability and Statistics?</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>20-May</td>
<td>Monday</td>
<td>3, 4</td>
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<tr>
<td>3</td>
<td>1</td>
<td>21-May</td>
<td>Wednesday</td>
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<td>4</td>
<td>1</td>
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<td>Simulation</td>
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<tr>
<td>5</td>
<td>2</td>
<td>27-May</td>
<td>Monday</td>
<td>9</td>
<td>Extra Notetaking and Sampling</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>28-May</td>
<td>Wednesday</td>
<td>10, 11</td>
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<tr>
<td>7</td>
<td>3</td>
<td>29-May</td>
<td>Monday</td>
<td>12, 13</td>
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</tr>
<tr>
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<td>3</td>
<td>30-May</td>
<td>Wednesday</td>
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<tr>
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<td>31-May</td>
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<td>4</td>
<td>1-Jun</td>
<td>Monday</td>
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<td>Confidence intervals for the mean</td>
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<td>11</td>
<td>5</td>
<td>2-Jun</td>
<td>Wednesday</td>
<td>18, 19</td>
<td>Testing hypotheses: Essentials</td>
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<td>12</td>
<td>5</td>
<td>3-Jun</td>
<td>Wednesday</td>
<td>20, 21</td>
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<td>13</td>
<td>6</td>
<td>4-Jun</td>
<td>Wednesday</td>
<td>22, 23</td>
<td>Comparing Two Samples</td>
</tr>
<tr>
<td>14</td>
<td>6</td>
<td>5-Jun</td>
<td>Wednesday</td>
<td>24, 25</td>
<td>Final Exam: Chapters 13 - 16, 19 - 20, 23 - 28</td>
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<tr>
<td>15</td>
<td>7</td>
<td>6-Jun</td>
<td>Wednesday</td>
<td>26, 27</td>
<td>Final Exam: Chapters 13 - 16, 19 - 20, 23 - 28</td>
</tr>
</tbody>
</table>

**Homework Assigned:**
- Homework Set 1
- Homework Set 2
- Homework Set 3
- Homework Set 4
- Homework Set 5
- Homework Set 6
- Homework Set 7
- Homework Set 8
- Homework Set 9
- Homework Set 10
- Homework Set 11
- Homework Set 12

**Homework Due:**
- Practice Exam (PE)
University Policy on Religious Holidays:

1. 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.
2. Faculty should extend to these students the courtesy of absence without penalty on such occasions, including permission to make up examinations.
3. Faculty who intend to observe a religious holiday should arrange at the beginning of the semester to reschedule missed classes or to make other provisions for their course-related activities.

Support for Students Outside the Classroom:

**Disability Support Services (DSS)**

Any student who may need an accommodation based on the potential impact of a disability should contact the Disability Support Services office at 202-994-8250 in the Rome Hall, Suite 102, to establish eligibility and to coordinate reasonable accommodations. For additional information please refer to: gwired.gwu.edu/dss/

**Mental Health Services 202-994-5300**

The University's Mental Health Services offers 24/7 assistance and referral to address students' personal, social, career, and study skills problems. Services for students include: crisis and emergency mental health consultations confidential assessment, counseling services (individual and small group), and referrals. counselingcenter.gwu.edu/

**Academic Integrity Code**

Academic dishonesty is defined as cheating of any kind, including misrepresenting one's own work, taking credit for the work of others without crediting them and without appropriate authorization, and the fabrication of information. For the remainder of the code, see:

studentconduct.gwu.edu/code-academic-integrity