Mathematical Modeling (MATH 420/620) Course Syllabus for Spring 2018

Class Numbers: MATH 420-1001 (84782) / MATH 620-1001 (84950) [3 Units]

Instructor: Paul J. Hurtado (email: `phurtado`)   **Website:** http://www.pauljhurtado.com/
Office: 220 DMSC   **Phone:** 775-784-4655 (Dept.: 775-784-6773)
Textbooks: Introduction to Probability Models (10th) by Sheldon Ross, and
Nonlinear Dynamics and Chaos (2nd) by Steve Strogatz.
Lectures: MWF 12:00-12:55pm in PE 104 (some MW in DMSC 106).
Office Hours: TBA, or by appointment in 220 DMSC.

Description: Formulation, analysis & critique of methods of mathematical modeling; selected applications in physics, biology, economics, political science & other fields. (Major Capstone Course.)

Course Pre-requisites: MATH 283 R (Calc III; C- or better); MATH/STAT 352 (Prob & Stat) or MATH 461 (Prob Theory); junior or senior standing. (Also, CH 201 & ENG 102)

Course Website: Registered students are responsible for frequently checking Web Campus, the course website at http://www.pauljhurtado.com/teaching/SP18/MATH420/ and their university email accounts. Students are assumed to be aware of all information posted prior to each lecture.

Course topics: Computing & Simulation, Stochastic Models, Statistics, Dynamic Models, Optimization.

Course Objectives: (For more on Silver Core Objectives see catalog & http://goo.gl/bnDbqo)

- **Integration & Synthesis (CO 13):** Students will be able to integrate and synthesize Core knowledge, enabling them to analyze open-ended problems or complex issues.
- **Application (CO 14):** Students will be able to demonstrate their knowledge & skills developed in previous Core & major classes by completing a project or structured experience of practical significance.

Student Learning Outcomes: Upon successful completion of this course, a student will be able to:

- choose and apply key mathematical and statistical techniques for solving problems in a diverse collection of scientific disciplines.
- organize and clean data; critically assess the origin of the data and method of data analysis.
- Students will be able to interpret the results of the modeling process to reach sound scientific conclusions within the problems economic, scientific, and social context.
- Students will be able to propose a project (individually or in a group) and devise strategies and practices to do the research work that will lead, with the support of computational software (e.g. Maple, Mathematica, R, Matlab), to the writing of a technical report using professional typesetting software (e.g., LaTeX).

General Rules: I (the instructor) come to class to help you learn, and I expect you come to class to learn and help others learn. Everyone, myself included, is expected to be respectful to one another. Electronic devices like phones, music players, etc. are to be turned off while in the classroom, unless approved by the instructor. Disruptions during class may not be well tolerated, and are to be kept to a minimum.

Regarding Titles: Students often wonder how to address college professors. I'm comfortable with Dr. Hurtado, Prof. Hurtado, and Paul. What is more important is that we create an atmosphere of mutual respect on campus, and in the classroom - someone could call me Dr. Hurtado and treat me with less respect than someone who calls me Paul. I will typically refer to you by your first name, however please feel free to email me or speak with me if you would prefer that I address you with a different title.

Homework: Homework will be due approximately weekly. A subset of the assigned problems will be graded. Please write or type solutions legibly. I will give zero credit for problems I cannot easily read. Your solutions must show all relevant work, and be a clear explanation of your reasoning. The same applies to exams.

Exams: There will be two to three midterm exams and no comprehensive final exam.

Term Paper: Each student will complete a project and submit a term paper near the end of the course. The instructor will help you identify a good topic, and will consult closely with you during the semester. In addition to the term paper, students will also present their results on the final day of class. There is no final exam, so class may meet for project presentations during the time scheduled for our final exam.

Graduate/Undergraduate: Homeworks and exams may differ for graduate (620) and undergraduate (420) students. Math 620 student projects will be held to a higher standard, and that term paper must be formatted for submission to an appropriate peer-reviewed journal (actual submission is **not** required).

Final Grades: Your grade for the course will be determined as follows:

30% Homework   40% Exams   25% Project

The remaining 5% comes from the better of your *exams* grade and your *project* grade.

The grading scale that will be used is:

A	A-	B+	B	B-	C+	C	D	F
$\geq 93\%$	$\geq 90\%$	$\geq 87\%$	$\geq 83\%$	$\geq 80\%$	$\geq 77\%$	$\geq 70\%$	$\geq 60\%$	$< 60\%$

Computing Resources: Some coursework requires use of mathematical software. Students are assumed to have access to a computer with the free software R (www.r-project.org) or similar software (e.g., Python or Matlab) installed. Students are encouraged to use the R front-end RStudio (www.rstudio.com). Additional software (e.g., Maxima and LATEX editor TeXstudio) will be discussed during the first week.

Makeup, Late Policy: Late homework will not be graded. There will be no early or make-up exams. However, if you need to miss an exam due to participation in official university activities, you must make arrangements with the instructor at least two weeks prior to the exam in question.

Academic Dishonesty: Cheating, plagiarism or otherwise obtaining grades under false pretenses constitute academic dishonesty according to the code of this university. Academic dishonesty will not be tolerated and penalties can include filing a final grade of ''F''; reducing the student's final course grade one or two full grade points; awarding a failing mark on the coursework in question; or requiring the student to retake or resubmit the coursework. For more details, see the UNR General Catalog.

Disability Services: Any student with a disability needing academic adjustments or accommodations is requested to speak with the Disability Resource Center (Pennington Student Achievement Center, Suite 230) and then me, as soon as possible, to arrange for appropriate accommodations.

Academic Success Services: A common habit among successful students is to seek help outside of the classroom. Your student fees cover use of the Math Center (784-4433 or www.unr.edu/mathcenter), Tutoring Center (784-6801 or www.unr.edu/tutoring-center), and University Writing Center (784-6030 or www.unr.edu/writing-center). These centers support your classroom learning; it is your responsibility to take advantage of their services.

Statement on Audio and Video Recording: Surreptitious or covert video-taping of class or unauthorized audio recording of class is prohibited by law and by Board of Regents policy. This class may be videotaped or audio recorded only with the written permission of the instructor. In order to accommodate students with disabilities, some students may be given permission to record class lectures and discussions. Therefore, students should understand that their comments and actions during class may be recorded.

Equal Opportunity & Title IX: The University of Nevada, Reno is committed to providing a safe learning and work environment for all. If you believe you have experienced discrimination, sexual harassment, sexual assault, domestic/dating violence, or stalking, whether on or off campus, or need information related to immigration concerns, please contact the University's Equal Opportunity & Title IX office at 775-784-1547. Resources and interim measures are available to assist you. For more information, please visit: https://www.unr.edu/equal-opportunity-title-ix.