

**ERE445/645: Hydrologic Modeling  
Syllabus: Spring 2021**

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**Teaching Assistant:** Priya Rajashekar [prajashe@syr.edu](mailto:prajashe@syr.edu)

**Office Hours:** Days before homework is due and by appointment

**Lectures:** Mon/Wed: 2:15 pm – 3:35 pm, online via Zoom

**Course Description:**

An exploration of deterministic and stochastic hydrologic models, model development, and the use of computer programming to construct, calibrate, manipulate, and interpret hydrologic models. Theoretical and analytical approaches to describing hydrologic processes, including precipitation, evapotranspiration, infiltration, surface runoff, percolation, and groundwater discharge. Stochastic techniques include frequency, trend, and regression analyses.

**Prerequisites:**

APM206 or equivalent (at least 1 calculus course)  
ERE335, APM595 or equivalent (some exposure to computer programming and data analysis)  
APM395/595 recommended (some exposure to probability and statistics)

**Required Texts and Supplies:**

Course reader (posted on Blackboard)

**Recommended Texts and Supplies:**

Singh, V.P. (2016). Handbook of Applied Hydrology, Second Edition, McGraw-Hill.  
Introductory probability and statistics text  
Introductory hydrology text

**Course Software:**

In this course, we will primarily use the software package R. R is a language and environment for statistical computing and graphics. We will use multiple computing packages within the R environment. We will also use Excel for some data pre-processing, the graphical user interface RStudio, and potentially the post-processing output of R Markdown. These packages are available in the ESF and SU computer clusters. The R package is freeware, and can be downloaded for multiple computing platforms at <https://www.r-project.org/>. RStudio is also freeware and can be obtained at <https://www.rstudio.com/>.

**Course Objectives:**

- 1) To develop and improve your computer programming and data manipulation skills
- 2) To gain experience in the development and programming of stochastic and deterministic hydrologic models
- 3) To introduce you to commonly employed rainfall-runoff models and modeling techniques, and to investigate the performance of some of these models
- 4) To critically evaluate some hydrologic publications and models
- 5) To provide an introduction to physics based and empirical models for hydrologic phenomenon, such as:

Precipitation	Infiltration	Evapotranspiration
Groundwater	Runoff	Streamflow
- 6) To introduce you to various literature sources that may aid you in future modeling efforts

**Program Learning Objectives:**

By the end of the semester students should be able to:

- a) Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics (ABET outcome 1)
- b) Analyze and interpret data and use engineering judgment to draw conclusions (ABET outcome 6)
- c) Acquire and apply new knowledge as needed, using appropriate learning strategies (ABET outcome 7)

**College Learning Outcomes:**

This course will contribute to students achieving the following College-wide learning outcomes:

- a) Quantitative Reasoning: Students will be able to effectively describe, interpret, apply, and evaluate quantitative information.
- b) Technological and Information Literacy: Students will be able to: use critical thinking skills to determine the information needed to solve a problem, access information using appropriate technologies, and effectively and appropriately use information to accomplish a specific purpose.
- c) Critical Thinking: Students will be able to: identify, analyze, evaluate, and develop well-reasoned arguments.

**Grading:**

- 60% Homework Problems
- 10% In-class assignment/presentations
- 10% Class attendance (you may have 2 unexcused absences from class during the semester without penalty)
- 20% Final Exam

Students enrolled in ERE645 will have additional assignments, expectations and presentations compared to students in ERE445. This will factor into their homework and in-class assignment/presentation grades.

**Grading Scale:**

93 – 100	A	77 – 80	C+
90 – 93	A-	73 – 77	C
87 – 90	B+	70 – 73	C-
83 – 87	B	65 – 70	D
80 – 83	B-	< 65	F

**Attendance Policy:**

Given our online delivery of this course and the shortened semester, attendance is required this semester and will impact your final grade. Attendance will be given for being in present 50 minutes out of the 80-minute class period. Those requesting excused absences should email the professor **prior to the missed class** (if possible) indicating the reason for the absence.

Students will be required to work collectively (and individually) on in-class problems throughout the semester and may be asked to present to the class. In class problems will count towards your final class grade.

**Problem Sets:**

- 1) There will be a number of assigned programming/modeling problems throughout the semester
- 2) Most problems will require the development of a mathematical model, construction of an appropriate computer program, and use of the program to solve the problem
- 3) Your code must be well documented, with all variables clearly defined at the beginning of the program!
- 4) You may freely discuss methods, programs, and results with anyone. However, you must complete your own analyses, programming, and write-ups. This write-up should be professional (i.e. clear and concise), but does not need to be typed.

**Academic Dishonesty:**

Academic dishonesty is a breach of trust between a student, one's fellow students, or the instructor(s). By registering for courses at ESF you acknowledge your awareness of the ESF Code of Student Conduct (<http://www.esf.edu/students/handbook/StudentHB.05.pdf>), in particular academic dishonesty includes but is not limited to plagiarism and cheating, and other forms of academic misconduct. The Academic Integrity Handbook contains further information and guidance (<http://www.esf.edu/students/integrity/>). Infractions of the academic integrity code may lead to academic penalties as per the ESF Grading Policy (<http://www.esf.edu/provost/policies/documents/GradingPolicy.11.12.2013.pdf>). Students should pay particular attention to their programming assignments, which should be performed independently of other students. Students are allowed to discuss their assignments with others in the class (see Problem Sets above), but must perform their own coding, analysis, and discussion.

**Sources of Support and Class Absence:**

If you experience academic or personal difficulties that affect your studies or life, there are people and resources that will help you. There is a website that serves to answer many student questions: <http://www.esf.edu/students/success>. In addition, the ESF Office of Student Life, 110 Bray Hall (470-6660) will provide academic support, career guidance, personal counseling or direct you to the proper source of help. If you encounter a situation beyond your control in which you will be missing 3 or more days of classes, you should contact the Office of Student Life and they will get in touch with all your instructors for you. Supportive documentation may be required.

**Accommodations for Students with Learning and Physical Disabilities:**

SUNY-ESF works with the Office of Disability Services (ODS) at Syracuse University, who is responsible for coordinating disability-related accommodations. Students can contact ODS at 804 University Avenue- Room 309, 315-443-4498 to schedule an appointment and discuss their needs and the process for requesting accommodations. Students may also contact the ESF Office of Student Affairs, 110 Bray Hall, 315-470-6660 for assistance with the process. To learn more about ODS, visit <http://disabilityservices.syr.edu>. Authorized accommodation forms must be in the instructor's possession one week prior to any anticipated accommodation. Since accommodations may require early planning and generally are not provided retroactively, please contact ODS as soon as possible.

**Inclusive Excellence Statement:**

As an institution, we embrace inclusive excellence and the strengths of a diverse and inclusive community. During classroom discussions, we may be challenged by different ideas. Understanding individual differences and broader social differences will deepen our understanding of each other and the world around us. In this course, all people are strongly encouraged to respectfully share their unique perspectives and experiences. This statement is intended to help cultivate a respectful environment, and it should not be used in a way that limits expression or restricts academic freedom at ESF.

**Religious Observance:**

ESF protects the rights of students to observe religious holy days according to their tradition. Students will be provided an opportunity to make up any exam or work requirements that may be missed due to a religious observance provided they give the instructor reasonable advance notification.