ERE445/645: Hydrologic Modeling
Syllabus: Spring 2019

Professor: Chuck Kroll, 424 Baker Lab, cnkroll@esf.edu, (315) 470-6699

Teaching Assistant: Brenden Covert, 410 Baker Lab, bhcovert@syr.edu

Office Hours: Days before homework is due and by appointment

Mailbox: The course mailbox is located in the hallway outside of Baker 402.

Lectures: Mon/Wed: 2:15 pm – 3:35 pm, Baker 310

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 recommended

Required Texts and Supplies:

Course packet (for sale at SUNY ESF Copy Center)

Singh, V.P. (2016). Handbook of Applied Hydrology, Second Edition, McGraw-Hill.

Recommended Texts and Supplies:

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, and the graphical user interface RStudio. These packages are available in the ESF 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/.

Grading:

72% Assigned Problems, Projects and Presentations
28% Final Exam/Quizzes (20%/8%)

Students enrolled in ERE645 will have additional assignments, expectations and potentially presentations compared to students in ERE445.

Attendance Policy:

Attendance is highly recommended, but will not impact your grade. Students may be required to make presentations in class and work collectively on in-class problems throughout the semester. In class problems will count towards you final class grade.

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, models, and modeling results
5) To provide an introduction to physics based and empirical models for hydrologic phenomenon, such as:

Precipitation	Infiltration
Evapotranspiration	Groundwater Discharge
Runoff Mechanisms	Streamflow

6) To introduce you to various literature sources that may aid you in future modeling efforts

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.

Program Learning Objectives:

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

a) Apply knowledge of mathematics, science and engineering (ABET outcome a)
b) Identify, formulate, and solve engineering problems (ABET outcome e)
c) Use the techniques, skills, and modern engineering tools necessary for engineering practice (ABET outcome k)

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.

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 programing 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.