SYLLABUS

**1. Number and Name: 11:117:333 –ENVIRONMENTAL ENGINEERING
ANALYSIS TOOLS**

2. Credits and contact hours: 3 credits, 2-80 min. periods per week

3. Instructor: Valdis Krumins

4. Text: *Python and Matplotlib Essentials for Scientists and Engineers.* M.A. Wood.
            Morgan & Claypool., 2015.

   Reference: *Fundamentals of Environmental Sampling and Analysis*. C. Zhang. Wiley, 2007.

5. Specific Course Information

   a. Catalog Description: *This course applies state-of-the-art environmental engineering
      tools in analyzing problems and creating solutions and designs. Tools include, as
      examples, measurement tools and techniques, programming languages and
      software for graphics, statistical analysis and modeling. Tools may vary with
      current engineering practice.*

   b. Prerequisites: 14:440:127 Introduction to Computers for Engineers
               14:180:215 Engineering Graphics, *or*
               14:180:216 Introductory Computer-Aided Design and Drafting

   c. Course Type: Required

6. Course Goals

a. Specific Instructional Outcomes: Students will learn how to obtain data from a variety of
      sources, select an appropriate computing tool, validate data and present it in a human-
      interpretable form, parameterize an environmental system model using real data, and use
      the model to optimize the system or predict its behavior.

b. Specific Student Outcomes addressed by the course include:

b. Ability to design and conduct experiments, as well as to analyze and interpret data
Instructional Activity: The lectures and four group projects are specifically targeted at the
acquisition, analysis and interpretation of data. Topics of experimental design and its effect on
data quantity and quality will be covered in lectures, and explored in the first project.

Assessment Activity: Weekly quizzes assess student mastery of data analysis techniques presented in class. (20% of assessment)
Students submit 4 projects and reports. The instructor grades the project for functionality, and corrects reports for grammar, format, clarity, data analysis and interpretation. (80% of assessment)

e. Ability to identify, formulate and solve engineering problems
Instructional Activity: Lectures and one project link analysis of environmental data to model parameterization and design of an engineering system.
Assessment Activity: Design and reporting in one project (50% of assessment)
Weekly quiz (50% of assessment)

k. Ability to use techniques, skills and modern engineering tools
Instructional Activity: Instruction will be provided concerning the fundamental principles of various modern environmental engineering tools for data acquisition, validation, interpretation, analysis, and incorporation into models.
Assessment Activities: Weekly quizzes (40% of assessment)
Design and reporting of four projects (60% of assessment)

7. Topics:

LECTURE	TOPIC
1 - 4	Analysis and handling large data sets.
	Project 1: integrating external and local data; modeling linkages
5 – 6	Data filtering, pre-processing, quality control
7 – 13	Modeling with spreadsheets and MATLAB
	Project 2: finite difference model of 1-D contaminant transport
14 - 17	Python; accessing external data sources
	Project 3: Analyzing trends in large contaminant database
18 – 23	Descriptive statistics, exploratory data analysis,
24 - 28	Non-linear curve-fitting and parameterization
	Project 4: parameterizing a model of a real environmental system

Grading:	Four Group Projects (20% each)
	Weekly quizzes (20%)

Prepared by: Valdis Krumins   01/15/18