

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Department of Civil and Environmental Engineering

1.731 Water Resource Systems

Class Survey

Due: Tuesday, Sept. 12, 2006

Please submit responses to these questions in writing and be sure to include your name and email.

Education and Work Experience:

1. Summarize in a few sentences your educational background (topics studied and out-of-classroom research experience).
2. Summarize in a few sentences your engineering-related work experience (outside of a university setting).

Technical Skills:

I know that most of you could carry out the following, given appropriate references and enough time. I am interested primarily in 1) whether you have ever done any of these things already and 2) if you could do them relatively easily now without lots of research and effort.

1. Could you write a MATLAB code to simulate runoff from a watershed if you were given a spatially lumped description of the rainfall-runoff process in the form of an ordinary differential equation?
2. Could you fit (by hand) a quadratic curve to a set of (x,y) data and construct confidence intervals that extend beyond the range of the data?
3. Could you perform an eigen decomposition of a 3 by 3 matrix by hand? On MATLAB?
4. Could you generate, in MATLAB, a random autoregressive type 2, AR(2), time series to simulate daily variations in an environmental variable such as air temperature?
5. Could you find (by hand) the relative maxima of a specified differentiable function of 3 unknowns, subject to 2 specified linear equality constraints in these unknowns? What if the constraints are inequalities?
6. Do you know the difference between a local and global minimum?

7. Have you used optimization software? What kind?
8. Could you find an equilibrium price, given supply and demand curves for a commodity?
9. Could you find the net present value of a stream of annual costs, given a specified interest rate and time horizon?
10. Are you familiar with the term “Pareto frontier”?

Interests

1. Water resource systems traditionally covers a range of topics, from optimization methods such as stochastic dynamic programming, through economic cost-benefit analysis, to political considerations involved in water-related negotiations and environmental protection. Please assess the nature of your “policy” orientation on a scale of 0-10, where 0 is no interest in policy (you only care about mathematical analysis) and 10 is interest only in policy aspects (you would rather avoid mathematics). Realizing that such a rating is simplistic, please feel free to elaborate in a few sentences.
2. How do you feel about a subject that derives your grade from a large individualized project vs. one that relies on frequent (e.g. weekly) problem sets?
3. Please summarize in a few sentences your expectations for this subject. Indicate what skills, insights, etc. you would like to take away from your experience.