HWR 642
MERGING DATA WITH MODELS
(3 Units)

COURSE OUTLINE
Spring Each Year

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GOALS:

a) Familiarity with the language, methods and tools of systems analysis (SA)
b) Understanding of the usefulness, strengths and limitations of commonly used
   methods for merging data with models in the context of engineering or
   scientific problem solving applications..
c) Familiarity with Dynamic Systems Modeling using Matlab™

CATALOG DESCRIPTION: Presentation and evaluation of a variety of approaches
and practical techniques for merging data with hydrologic models; advantages and
limitations of various methods used in hydrologic modeling; interrelation between
system identification, calibration and evaluation of models, and data assimilation.

GRADING: Regular grades are awarded for this course: A B C D E.

PREREQUISITES: HWR 528 (Fundamentals: Systems Approach to Hydrologic
Modeling) and SIE 305 (Intro to Engineering Probability & Statistics) or
equivalents, or consult with course instructor.

DESIRABLE BACKGROUND: MATH 125 (Calculus I), MATH 129 (Calculus II),
Math 254 (Introduction to Ordinary Differential Equations), ECE 175 (Computer
Programming for Engineering Applications), or equivalents.

MATERIALS REQUIRED: MATLAB™ Student Edition (available from UA
bookstore or online), access to a personal computer.

1 January 12, 2011
OFFERED:  Spring each year

KEY CONCEPTS: Merging data and models; systems approach; systems identification; estimation theory; single- & multiple-criteria optimization & analysis; sensitivity analysis; estimating/propagating uncertainty; basic numerical methods; model performance evaluation; diagnostic evaluation; model complexity; information theory; other issues.

DESIRED OUTCOMES:
   a) Understanding of the key concepts of non-linear systems identification and estimation theory as listed under "Key Concepts".
   b) Ability to apply systems identification methods to dynamical hydrologic systems models of interest.
   c) Ability to compare and critique various methods and approaches.
   d) Familiarity with computer-based algorithms codes and tools.
   e) Familiarity with the language and methods of systems analysis

CLASS FORMAT: Meet once per week for 3.0 hours (Day TBD), 15 active weeks (incl. introductory meeting, lectures, and student projects/presentations).

CONTENT:
   • ~10 topics
   • MATLAB™ projects and assignments as assigned
   • Collaborative term project + presentation as assigned

STUDENTS WITH DISABILITIES: If you anticipate barriers related to the format or requirements of this course, please meet with me so that we can discuss ways to ensure your full participation in the course. If you determine that disability-related accommodations are necessary, please register with Disability Resources (621-3268; drc.arizona.edu) and notify me of your eligibility for reasonable accommodations. We can then plan how best to coordinate your accommodations.