TEXAS A&M UNIVERSITY

SYLLABUS

Course title and number	Upscaling of Geologic Models for Flow Simulation
Term (e.g., Fall 200X)	Fall 2009
Meeting times and location	2:20 – 5:10 p.m., Thursday, RICH 407M???

Course Description and Prerequisites

This is a special topics course which covers the upscaling of 3D geologic models for reservoir flow simulation. It is based on published papers and supplemented by research topics. The students will be expected to develop upscaling solvers as part of this course.
Graduate classification. Attendance will be limited to a maximum of 15 students.

Learning Outcomes or Course Objectives

The objectives of the course are for students to:

1. Develop an in-depth understanding of current approaches to upscaling of geologic models for flow simulation.

Instructor Information

Name	Dr. Michael J. King
Telephone number	(979) 845-1488
Email address	mike.king@pe.tamu.edu
Office hours	W, 2:00-5:00 p.m.
Office location	401E Richardson Building

Textbook and/or Resource Material

Readings will be supplied with the course.

Grading Policies

Presentations & Class Participation.....(10%)
Homework.....(15%)
Major Project.....(25%)
Mid-Term Exam.....(25%)
Final Exam.....(25%)
Total.....(100%)

Grading Scale

A.....90-100%
B.....80-89%
C.....70-79%
D.....60-69%
F.....0-59%

Course Topics, Calendar of Activities, Major Assignment Dates

Week	Topic
1	Introduction to geologic modeling and flow simulation: o Uses of geologic models and reservoir simulators o Understanding of the overall iterative workflow o Streamline flow visualization
2	Basic multi-phase flow equations in porous media o Black oil equations o Derivation of the pressure equation o Variational formulation o Neumann and Dirichlet boundary conditions
2-3	Finite difference/Finite element discretizations/solver projects o Five point discretization (2D) o Peaceman Well Indices (2D) o O/U method (2D) o Seven point discretization (2D) o Development of student projects
4	Grid upscaling, Volumetric upscaling & Diagnostics o Grid-to-grid operations; Property Resampling & Diagnostics o Grid-to-grid operations: Grid Coarsening & Diagnostics o Statistical layer grouping: Speed & Slowness o Statistical layer grouping: Stern & Dawson o Static property volumetric upscaling o Facies upscaling and end point saturations
5-6	Permeability upscaling o Arithmetic/Harmonic/Geometric/ Power Law o Arithmetic-Harmonic/Harmonic-Arithmetic o Flow based upscaling o Boundary Conditions o Effective Medium o Near Well Upscaling o Global Methods o Error Estimates
6-7	Transmissibility Upscaling o Transmissibility versus Permeability o Global Methods o Semi-local Methods o Well Productivity o Half Cell Upscaling o Diagnostics
8-9	Multiphase Upscaling

	○ Pseudoization ○ Capillary Pressure ○ Steady State Approaches ○ End-Point Upscaling ○ Dynamic Techniques
10-12	Class Projects ○ Presentations on papers
13-15	Class Projects ○ Upscaler solver results

Other Pertinent Course Information

Americans with Disabilities Act (ADA)

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, in Cain Hall, Room B118, or call 845-1637. For additional information visit http://disability.tamu.edu

Academic Integrity

For additional information please visit: http://www.tamu.edu/aggiehonor

"An Aggie does not lie, cheat, or steal, or tolerate those who do."