Flow & Transport in Porous Media (MechEng 707-002)

Time: Thursday 4:30-7:10 p.m.  
Venue: EMS W130

Instructor: Dr. Krishna M. Pillai  
Office Hours: M 10-11 am  
W 3-4 pm or  
by appointment

EMS 945, 229-6535  
e-mail: krishna@uwm.edu

Prerequisites: Graduate student status or approval by the instructor.

Course Contents: Types of porous media; applications (groundwater flow, oil exploration, processing of composites, etc.); volume averaging; saturated and unsaturated flows; governing equations based on mass, momentum, energy and species conservation; measurement of relevant parameters (permeability, capillary pressure, etc.); Buckley-Leverette flows; heat transfer and solute transport in porous media; Network models

Textbook:  
Dynamics of Fluids in Porous Media by Jacob Bear, Dover Publications.

Class Notes and relevant Research Papers will also be distributed.

Other References:

• Flow and Transport in Porous Media and Fractured Rock by Muhammad Sahimi, VCH.
• The physics of flow through porous media by Adrian E. Scheidegge, third edition, University of Toronto Press.
• Convection in Porous Media by D.A. Nield & A. Bejan, Springer-Verlag.
Exams: There will be one mid-term exam of weight 20 points, and the final exam at the end of the semester will carry a weight of 40 points. The overall split is:

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<tr>
<th>Component</th>
<th>Weight</th>
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<tr>
<td>Mid-term exam</td>
<td>20 %</td>
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<tr>
<td>Final exam</td>
<td>40 %</td>
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<tr>
<td>Homework</td>
<td>10 %</td>
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<td>Small Projects</td>
<td>10 %</td>
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<td>Main Project</td>
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Homework: Weekly home assignments and small projects will be assigned throughout the semester. The solutions to the homework will be posted on a Desire 2 Learn® (D2L) web page following the due date of the assignment. Home assignment submitted after the posting of its solution will not be graded. The web page can be accessed through the D2L link at UWM web site. You should have an internet browser with Adobe Acrobat Reader Plug-in in order to see the assignment and exam solutions which typically will be in the form of PDF files.

Projects: Each student will be asked to choose one main-project topic. The students are expected to search topics in various areas such as groundwater flow, polymer composites, drying, and oil exploration. The students are expected to do some research and literature review on the problem before embarking on the project. Apart from submitting a brief report, the student will present his results in front of the class at the end of the semester. (The report and the presentation will carry weights of 80% and 20% respectively.) Small projects without any time limits will be assigned throughout the semester.

Tentative Course Schedule

--week of March 14: Mid-term Exam

--week of May 9: Project presentation and evaluation

--May 19 (4:30-7:10 pm): Final Exam
PARTICIPATION BY STUDENTS WITH DISABILITIES:

If you need special accommodations in order to meet any of the requirements of this course, please contact your instructor as soon as possible. (Developed in consultation with the Association on Higher Education and Disability.)

ACCOMMODATION FOR RELIGIOUS OBSERVANCES:

Students will be allowed to complete examinations or other requirements that are missed because of a religious observance. (From UWM faculty Document #1918.)

ACADEMIC MISCONDUCT:

The university has a responsibility to promote academic honesty and integrity and to develop procedures to deal effectively with instances of academic dishonesty. Students are responsible for the honest completion and representation of their work, for the appropriate citation of sources, and for respect of others' academic endeavors. Cheating in exams may lead to the awarding of an F grade. A more detailed description of Student Academic Disciplinary Procedures may be found in Regents Policy Statements, UWS Chapter 14 and UWM Faculty Document #1686.

COMPLAINT PROCEDURES:

Students may direct complaints to the head of the academic unit or department in which the complaint occurs. If the complaint allegedly violates a specific university policy, it may be directed to the head of the department or academic unit in which the complaint occurred or to the appropriate university office responsible for enforcing the policy.

GRADE APPEAL PROCEDURES:

A student may appeal a grade on the grounds that it is based on a capricious or arbitrary decision of the course instructor. Such an appeal shall follow the established procedures adopted by the department, college, or school in which the course resides. These procedures are available in writing from the respective department chairperson or the Academic Dean of the College/School. A more detailed description of the grade Appeal Policy may be found in UWM Selected Academic and Administrative Policies, Policy #S-28 and UWM Faculty Document #1243.

SEXUAL HARASSMENT:

Sexual harassment is reprehensible and will not be tolerated by the University. It subverts the mission of the University and threatens the careers, educational experience, and well being of students, faculty, and staff. The University will not tolerate behavior between or among members of the University community which creates an unacceptable or working environment.
**INCOMPLETES:**

A notation of "incomplete" may be given in lieu of a final grade to a student who has carried a subject successfully until the end of a semester but who, because of illness or other unusual and substantiated cause beyond the student's control, has been unable to take or complete the final examination or to complete some limited amount of term work. An incomplete is not given unless you prove to the instructor that you were prevented from completing course requirements for just cause as indicated above. A more detailed description of the Incomplete Policy may be found in UWM Selected Academic and Administrative Policies, Policy #S-31 and UWM Faculty Documents #1588 and #1602. Also, a description of this policy may be found in the UWM Schedule of Classes.

**FINANCIAL OBLIGATION:**

The submission on your registration form and your subsequent assignment to classes obligates you to pay the fee-tuition for those classes or to withdraw your registration in writing no later than the date specified in the schedule of classes. It is important to both you and the University that you make payment on time. A complete description of UWM fee policies may be found in the Schedule of Classes.