

Course: **MinE 628 – Computation Fluid Flow in Mineral Engineering**

Semester: Fall 2007

Course Format and Credit hours: 3 hr lecture  
3 credit-hour

Prerequisites: Graduate Standing or Consent

Instructor: Dr. Felicia F. Peng  
Room 359F Mineral Resources Bldg.  
293-7680 ext. 3308 [ffpeng@mail.wvu.edu](mailto:ffpeng@mail.wvu.edu)

Schedule: Tuesday, Thursday 2:00 p.m. - 3:15 p.m.

Location: Rooms 105 and 243 Mineral Resources Bldg.

Office Hours: Open door policy or by appointment

Course objectives: To provide students the knowledge and understanding of fluids transportation problems in mineral engineering. To equip students the appropriate theoretical methods for solving the application of fluid dynamics and fluid transportation problems. Computer-based approaches are emphasized throughout the course, thus to provide students with useful tools to deal with fluid flow problems in practical operations and design problems.

Expected Learning Outcomes:

Upon successful completion of this course:

1. Students will have the knowledge of fluid transportation problems in mineral engineering.
2. Students will gain the knowledge of all types of fluids from simple Newtonian fluids, to non-Newtonian slurries with complex rheological properties which emphasize in this course.
3. With a uniform treatment of all types of fluids in this course, will allow students to develop a consistent method when approaching problems.
4. Students will allow to review of properties of fluids, friction factors, energy balance for piping system, interaction between fluids and particles before gaining the knowledge of non-Newtonian fluid flow.
5. Students will gain the computer skills of using fluids toolbox, and writing custom programs to implement in fluids toolbox, or use of add-in capability of spreadsheets to solve the fluid transportation problems in mineral engineering.

Required Text: King, R. P., *Introduction to Practical Fluid Flow, supplemented with the manual for fluids toolbox*, Butterworth-Heinemann, 198 pp.

Reference Texts: Coal Preparation, 5th edition, edited by Leonard, J. W. III, SME, Littleton, CO., 1991, 1131 pp.

Fuerstenau, M. C., and Han, K. N., Principles of Mineral Processing, SME, Littleton, CO. 2003, 573 pp.

Chhabra, R. P., and Richardson, J. F. Non-Newtonian Flow in the Process Industries, Butterworth-Heinemann, 1999, 436 pp.

Grading: Homework and Quizzes 60%  
Assigned project 40%

Grading Assignment:

90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
< 60	F

Notes:

- The instructor reserves the right to decrease or increase the cut-off point between any two grades.
- No homework, no grade.
- Late homework or assigned project report will be accepted with a penalty of 20% per day.

Attendance Policy:

- Attendance is absolute necessary. Absence from class more than three times will be asked to drop the class.
- No make-up quizzes except by prior arrangement with instructor, according to WVU Guidelines. The highest score for a make-up quiz will be reduced to 70%.

Social Justice Statement:

"West Virginia University committed to social justice. I concur with that commitment and expect to maintain a positive learning environment based upon open communication, mutual respect, and nondiscrimination. Our University does not discriminate on the basis of race, sex, age, disability, veteran status, religion, sexual orientation, color or national origin. Any suggestions as to how to further such a positive and open environment in this class will be appreciated and given serious consideration."

If you are a person with a disability and anticipate needing any type of accommodation in order to participate in this class, please advise me and make appropriate arrangement with Disability Service (293-6700)".

Days of Special Concern:

WVU recognizes the diversity of its students and the needs of those who wish to be absent from class to participate in Days of Special Concern, which are listed in the Schedule of Courses. Students should notify their instructors by the end of the second week of classes or prior to the first Day of Special Concern, whichever is earlier, regarding Day of Special Concern observances that will affect their attendance. Further, students must abide by the attendance policy of their instructors as stated on their syllabi. Faculty will make reasonable accommodation for tests or field trips that a student misses as a result of observing a Day of Special Concern.

Course Schedule:

Week	Topic
1--2	Introduction fluid flow in mineral engineering Fluid properties and statics Practice problems
3--4	Fluid flow in piping systems Friction factor Energy balances Pumps and slurry pumping Practice problems
5--7	Interaction between fluids and particles Terminal settling velocity Isolated isometric particles of arbitrary shape Practice problems
8--10	Transportation of slurries Four regimes of flow for settling slurries Head loss correlations for separate flow regimes Head loss correlations for a stratified flow model Practice problems.
11--13	Non-Newtonian slurries Rheological properties of fluids Newtonian and non-Newtonian flows Power-law fluids in turbulent flow Shear-thinning fluids with Newtonian limit Practice problems
13--15	Sedimentation and thickening Concentration discontinuities in settling slurries Useful models for the sedimentation velocity Continuous thickening of compressible pulps Practice problems

Notes:

Practice problems solving will be conducted using fluids toolbox and spreadsheet. The fluids toolbox provided contains preprogrammed computational methods that will help the students to implement the theoretical methods to solve the fluid flow problems. Students will be able to add-in custom computer programs into fluids toolbox, or using add-in capability in spreadsheet to solve the fluid transportation problems.