

MCEN 6228 - Fall 2010

MULTIPHASE FLOWS

Instructor: Olivier Desjardins
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Office hours: Open door or by appointment

Course schedule: Tuesday/Thursday in ECCR 139 from 11 to 12:15

Text: No required textbook

Other references: Multiphase Flow Handbook, C. T. Crowe
Fluid Dynamics and Transport of Droplets and Sprays, W. A. Sirignano
Atomization and Sprays, A. H. Lefebvre
Multiphase Flows with Droplets and Particles, C. Crowe, M. Sommerfeld, Y. Tsuji

Introduction: In many engineering devices, and especially in energy conversion systems, multiphase flows play a crucial role. Similarly, many natural flows involve multiple phases. This course explores state-of-the-art modeling techniques for a range of multiphase flows, including solid particle-laden flows (as encountered in fluidized bed reactors, turbulent risers, dust clouds), liquid droplet-laden flows (as encountered in spray combustion, pharmaceutical coating, agricultural spraying, tire splashing, wave breaking), and more generally liquid-gas flows with complex phase-interface. The equations that describe each of these flows will be discussed in details, and various modeling techniques will be introduced. In particular, we will discuss both Eulerian and Lagrangian models for dispersed multiphase flows, as well as a range of phase-interface tracking models. Both heat and mass transfer will be considered.

Project: This course has a strong project component. Each student will be required to find a project topic within the first two weeks of class and write a two-page proposal about it (due 09/02/2010 in class). Please come talk to me first to ensure that the project you have in mind fits well in the class. Students will then have to present their progress on the project in the form of a 10 minutes presentation on 10/12/2010 or 10/14/2010. In addition, a written progress report of 5 pages or less will have to be turned in at the end of the presentation. During the last two weeks of class, a final 15 minutes presentation and a final report (10 pages or less) will conclude the project. I will grade your reports, but your fellow classmates will grade your performance for the presentations (based on clarity, depth of understanding, relevance of the topic, etc...)

Grading:	Progress report	20%	
	Progress presentation	20%	
	Final report	40%	
	Final presentation		40%

Communications: e-mail for official communication.

Other resources: <http://efluids.com>.

Additional policies:

1. If you qualify for accommodations because of a disability, please submit a letter to me from Disability Services in a timely manner so that your needs may be addressed. Disability Services determines accommodations based on documented disabilities. Contact: 303-492-8671, Willard 322, and <http://www.colorado.edu/disabilityservices>.

Disability Services' letters for students with disabilities indicate legally mandated reasonable accommodations. The syllabus statements and answers to Frequently Asked Questions can be found at <http://www.colorado.edu/disabilityservices>.

2. Campus policy regarding religious observances requires that faculty make every effort to reasonably and fairly deal with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. I will accommodate your personal needs. Please let me know during the next two weeks if the schedule above conflicts with your religious observances. See full details at http://www.colorado.edu/policies/fac_relig.html.

3. Students and faculty each have responsibility for maintaining an appropriate learning environment. Students who fail to adhere to such behavioral standards may be subject to discipline. Faculty members have the professional responsibility to treat all students with understanding, dignity and respect, to guide classroom discussion and to set reasonable limits on the manner in which they and their students express opinions. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, culture, religion, politics, sexual orientation, gender variance, and nationalities. Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. See policies at <http://www.colorado.edu/policies/classbehavior.html> and at http://www.colorado.edu/studentaffairs/judicialaffairs/code.html#student_code.

4. The University of Colorado at Boulder policy on Discrimination and Harassment: (<http://www.colorado.edu/policies/discrimination.html>) The University of Colorado policy on Sexual Harassment and the University of Colorado policy on Amorous Relationships apply to all students, staff and faculty. Any student, staff or faculty member who believes s/he has been the subject of discrimination or harassment based upon race, color, national origin, sex, age, disability, religion, sexual orientation, or veteran status should contact the Office of Discrimination and Harassment (ODH) at 303-492-2127 or the Office of Judicial Affairs at 303-492-5550. Information about the ODH and the campus resources available

to assist individuals regarding discrimination or harassment can be obtained at <http://www.colorado.edu/odh>.

5. All students of the University of Colorado at Boulder are responsible for knowing and adhering to the academic integrity policy of this institution. Violations of this policy may include: cheating, plagiarism, aid of academic dishonesty, fabrication, lying, bribery, and threatening behavior. All incidents of academic misconduct shall be reported to the Honor Code Council (honor@colorado.edu; (303) 725-2273). Students who are found to be in violation of the academic integrity policy will be subject to both academic sanctions from the faculty member and non-academic sanctions (including but not limited to university probation, suspension, or expulsion). Other information on the Honor Code can be found at <http://www.colorado.edu/policies/honor.html> and at <http://www.colorado.edu/academics/honorcode/>.