NE 402/502 Reactor Engineering

1. Boiling Heat Transfer and Two-Phase Flow
   1.1 Fundamental Concepts
   1.2 Boiling Regimes, Departure from Nucleate Boiling (DNB), Dryout
   1.3 Flow Boiling Heat Transfer
   1.4 Critical Heat Flux Correlations
      1.4.1 DNB
      1.4.2 Dryout

2. Single-Phase Flow
   2.1 Conservation Equations
      2.1.1 Mass
      2.1.2 Energy
      2.1.3 Momentum
      2.1.4 Equation of State
   2.2 Friction and Form Losses
      2.2.1 Friction Factors
      2.2.2 Bends, Valves and Fittings
      2.2.3 Expansions and Contractions
   2.3 Steady-State Applications
      2.3.1 Bernoulli's Equation
      2.3.2 Natural Convection Systems
   2.4 Mixing and Flow Redistribution

3. Two-Phase Flow
   3.1 Basic Concepts
   3.2 Conservation Equations
      3.2.1 Mass
      3.2.2 Energy
      3.2.3 Momentum
   3.3 Boiling and Non Boiling Heights
   3.4 Friction and Forms Losses
   3.5 Acceleration Losses
   3.6 Critical (Choked) Flow
Instructor

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Homework

Homework will be assigned periodically throughout the semester. The last homework assignment may be due during the last week of classes.

Homework should be turned in to me or the TA at the beginning of class, or emailed to me or the TA prior to class.

EOL students should submit their homework assignments directly to the TA or myself. DO NOT submit homework to EOL.

Late Assignments

 Unless stated otherwise, assignments are due at the beginning of class on the designated due date. Assignments turned in within 24 hours of this time are considered LATE and will be assessed a 25% penalty. Assignments turned in after 24 hours will be marked and returned to the student, but no credit will be assigned. To allow for unforeseen circumstances, students are granted a one time exemption if an assignment is turned in by 5:00 PM on the designated due date. Exceptions to this policy may be granted for documented medical or family emergencies.

Electronic Devices

 Cell phones and other electronic devices (including lap tops) are to be TURNED OFF during class and stored out of view. No exceptions. Electronic note pads may be used with consent of instructor.

Attendance Policy

 Class attendance is purely optional. However, students attending class room lectures are required to be on time. No admittance to the class room will be allowed for students appearing after class has begun. Participation in the laboratories is mandatory. Students who do not participate in the data acquisition portion of the laboratory will be penalized 50% of the laboratory grade.

Text and Selected References

1. J. M. Doster, Reactor Engineering Course Pack
3. N. E. Todreas and M. S. Kazimi, Nuclear Systems II-Elements of Thermal-Hydraulic Design
4. Collier, Convective Boiling and Condensation
5. El-Wakil, Nuclear Heat Transport
7. Tong and Weisman, Thermal Analysis of Pressurized Water Reactors
8. Wallis, One-dimensional Two-Phase Flow
*Grading*

- Mid-Term Exam: 20% (20%)
- Homework: 20% (20%)
- Project(s): 15% (40%)
- Lab: 25%
- Final Exam: 20% (20%)

*Grading percentages for NE 502 are shown in parentheses*

**Test Dates**

- October 3, 2017 (Mid-Term)
- December 5, 2017 (Final)

The Mid Term Exam is given at 6:00 PM for on campus students. The location will be determined at a later time.

**Students with Disabilities:** Students with disabilities that require special attention please notify the instructor.

**Captured Lectures**

This on campus course will be captured and distributed via the Internet and/or electronic media as part of the Engineering Online (EOL) program for the distance students. These video recordings may contain an image of you entering the classroom, asking a questions or being a part of the studio class. Please notify Dr. Linda Krute, Director of EOL, in writing at ldkrute@ncsu.edu if you **DO NOT** want your image to be included in the lecture presentation. If we do not hear from you after the first week of the class, we will assume that you are in agreement with this procedure.