Spring 2016 ME 523

NUMERICAL SOLUTIONS APPLIED TO HEAT TRANSFER AND FLUID MECHANICS

ANGEL: https://cms.psu.edu – ME 523

Meeting Time/Location  11:15 AM – 12:05 PM MWF, 327 Sackett Building

Instructor  Yuan Xuan
105 Research Building East
865-2165  yux19@psu.edu

Office Hours  MW 3:00 – 5:00 PM, 105 Research East (865-2165)
Generally available at other times – email first

Text  There is no required textbook. Materials will be furnished by the instructor as needed. The notation and development will follow most closely the approach in Ferziger and Perić (see p. 3).

Grading  Exam 1 (take home)  25%
Exam 2 (finals period)  25%
Assignments  50%

Course Outline  1. Physical Systems, Mathematical Models, and Numerical Methods
2. Discrete Mathematics
3. Finite-Volume Methods
4. Linear Systems
5. Unsteady Problems

---------------------------------- Mid-term ----------------------------------

6. The Navier-Stokes Equations
7. Heat Transfer and Fluid Mechanics Applications
Objectives

Computer simulations play an increasingly important role in understanding the behavior of existing physical systems, and in designing new systems. This course will provide basic information needed to understand the numerical methods used in such simulations, or to write new computer applications. The emphasis will be on finite-volume methods applied to the solution of fluid-flow and heat-transfer problems: specifically, pressure-based computational fluid dynamics (CFD) methods for low-Mach-number flows. The student will explore various numerical methods by implementing them in computer programs for homework assignments. At the end of the course, the student should be able to select/assess/devise effective numerical algorithms to solve systems of equations that arise in the thermal-fluids sciences and engineering.

Assignments

Assignments will range from the equivalent of short end-of-chapter problems to mini-projects. The points available for each assignment will vary accordingly. Students may use the MNE computer lab (http://www.mnelabs.mne.psu.edu/) or personal computers to complete programming assignments. Assignments are due at the beginning of the class period on the specified due date in the ANGEL drop box, unless specified otherwise. Late work will not be accepted without prior approval by the instructor.

Class Attendance

Attendance will not be taken. Students are responsible for all material covered/assigned, and must make their own arrangements (with other students) for any missed lecture notes or assignments. Contact your instructor prior to any anticipated absence. No make-up exams will be given except as required by University policy.

Information

ANGEL will be the principal means for distributing course material and information. Students should check the ANGEL course site (“Calendar” and “Lessons,” in particular) regularly. Assignments, updates and corrections, exam dates and material to be covered, and other information will be posted there.

Adjustments

Students who seek an academic modification or adjustment to minimize or eliminate the impact of a disability should discuss that with the instructor early in the semester. Penn State’s policy can be found at http://equity.psu.edu/ods/considering-penn-state/reasonable-accommodations.

Academic Integrity

Students are encouraged to discuss assignments with one another to the extent that they find that to be beneficial. However, each student is to turn in an individual computer program and/or other work that represents primarily his/her own effort. Exams are to be individual efforts; this includes take-home exams. Failure to abide by these rules, or the commission of any other deliberately dishonest act, may result in failure of the course with no late drop permitted. See also http://www.engr.psu.edu/AcademicIntegrity/default.aspx.
Bibliography


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1 Several books have been placed on reserve in the Engineering Library on the third floor of Hammond.